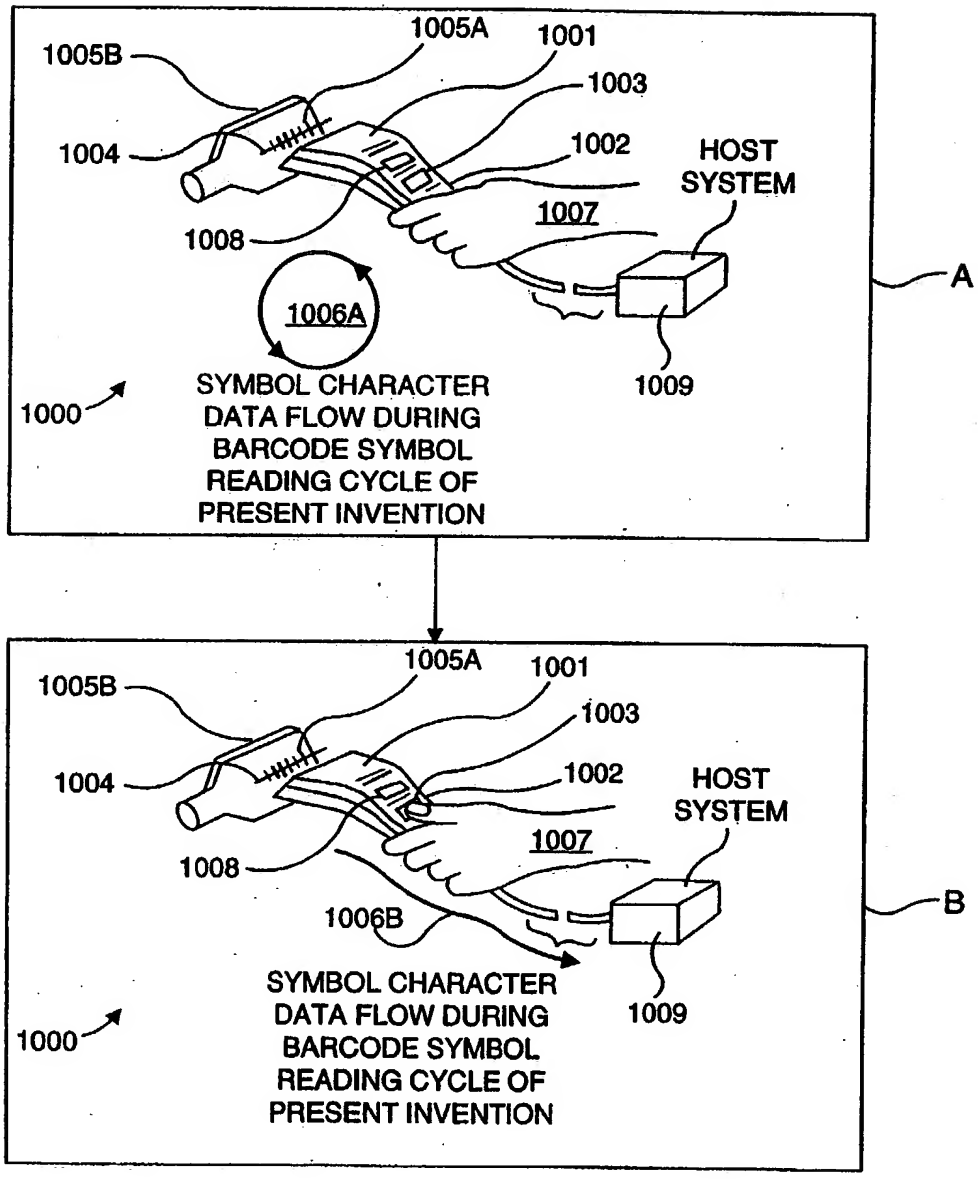

1005A
1001
1005B
1003
1004
1002
HOST SYSTEM
1007
1008
1006A
A
1009
1000
SYMBOL CHARACTER DATA FLOW DURING BARCODE SYMBOL READING CYCLE OF PRESENT INVENTION
1005A
1001
1005B
1003
1004
1002
HOST SYSTEM
1007
1008
1006B
B
1009
1000
SYMBOL CHARACTER DATA FLOW DURING BARCODE SYMBOL READING CYCLE OF PRESENT INVENTION

FIG. 1

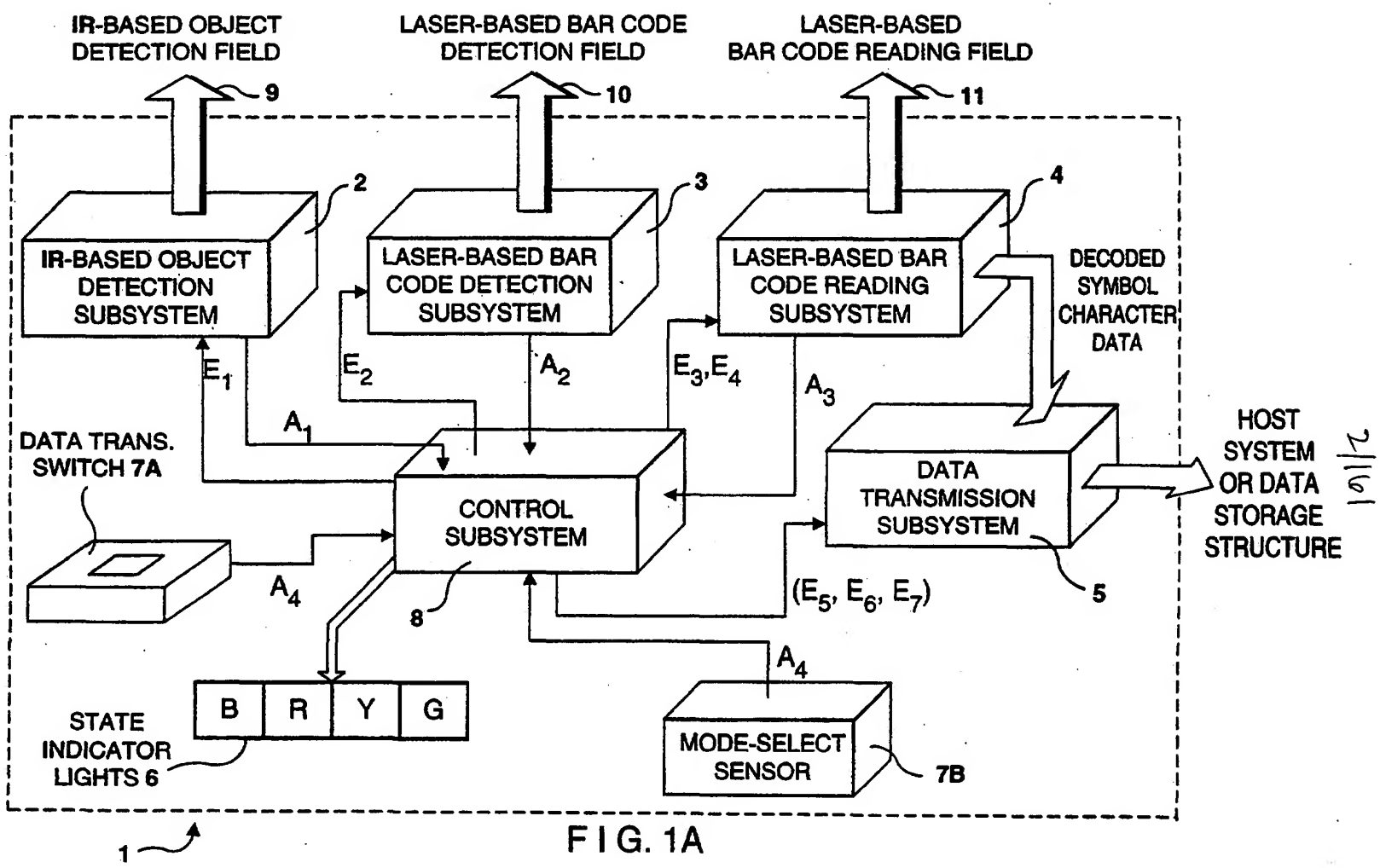

IR-BASED OBJECT DETECTION FIELD
LASER-BASED BAR CODE DETECTION FIELD
LASER-BASED BAR CODE READING FIELD
9
10
11
2
3
4
IR-BASED OBJECT DETECTION SUBSYSTEM
LASER-BASED BAR CODE DETECTION SUBSYSTEM
LASER-BASED BAR CODE READING SUBSYSTEM
DECODED SYMBOL CHARACTER DATA
E1
E2
A2
E3,E4
A3
A1
DATA TRANS. SWITCH 7A
CONTROL SUBSYSTEM
DATA TRANSMISSION SUBSYSTEM
HOST SYSTEM OR DATA STORAGE STRUCTURE
A4
8
(E5, E6, E7)
5
A4
B
R
Y
G
STATE INDICATOR LIGHTS 6
MODE-SELECT SENSOR
7B
1

FIG. 1A

2/19/1

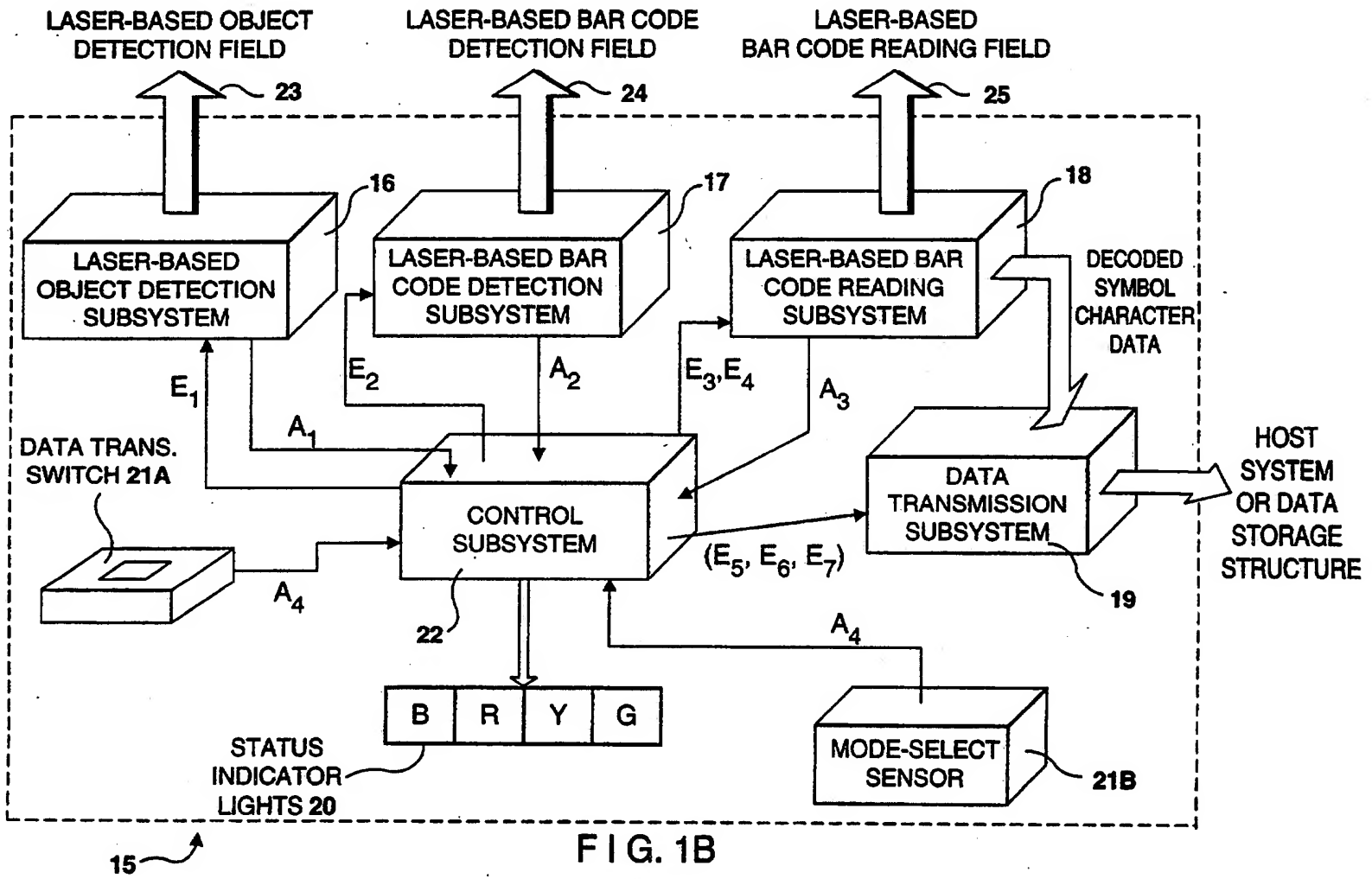

LASER-BASED OBJECT DETECTION FIELD
23
LASER-BASED BAR CODE DETECTION FIELD
24
LASER-BASED BAR CODE READING FIELD
25
16
17
18
LASER-BASED OBJECT DETECTION SUBSYSTEM
LASER-BASED BAR CODE DETECTION SUBSYSTEM
LASER-BASED BAR CODE READING SUBSYSTEM
DECODED SYMBOL CHARACTER DATA
E1
E2
A2
E3,E4
A3
A1
DATA TRANS. SWITCH 21A
CONTROL SUBSYSTEM
DATA TRANSMISSION SUBSYSTEM
HOST SYSTEM OR DATA STORAGE STRUCTURE
(E5, E6, E7)
19
A4
22
A4
B
R
Y
G
STATUS INDICATOR LIGHTS 20
MODE-SELECT SENSOR
21B
15

FIG. 1B

3/101

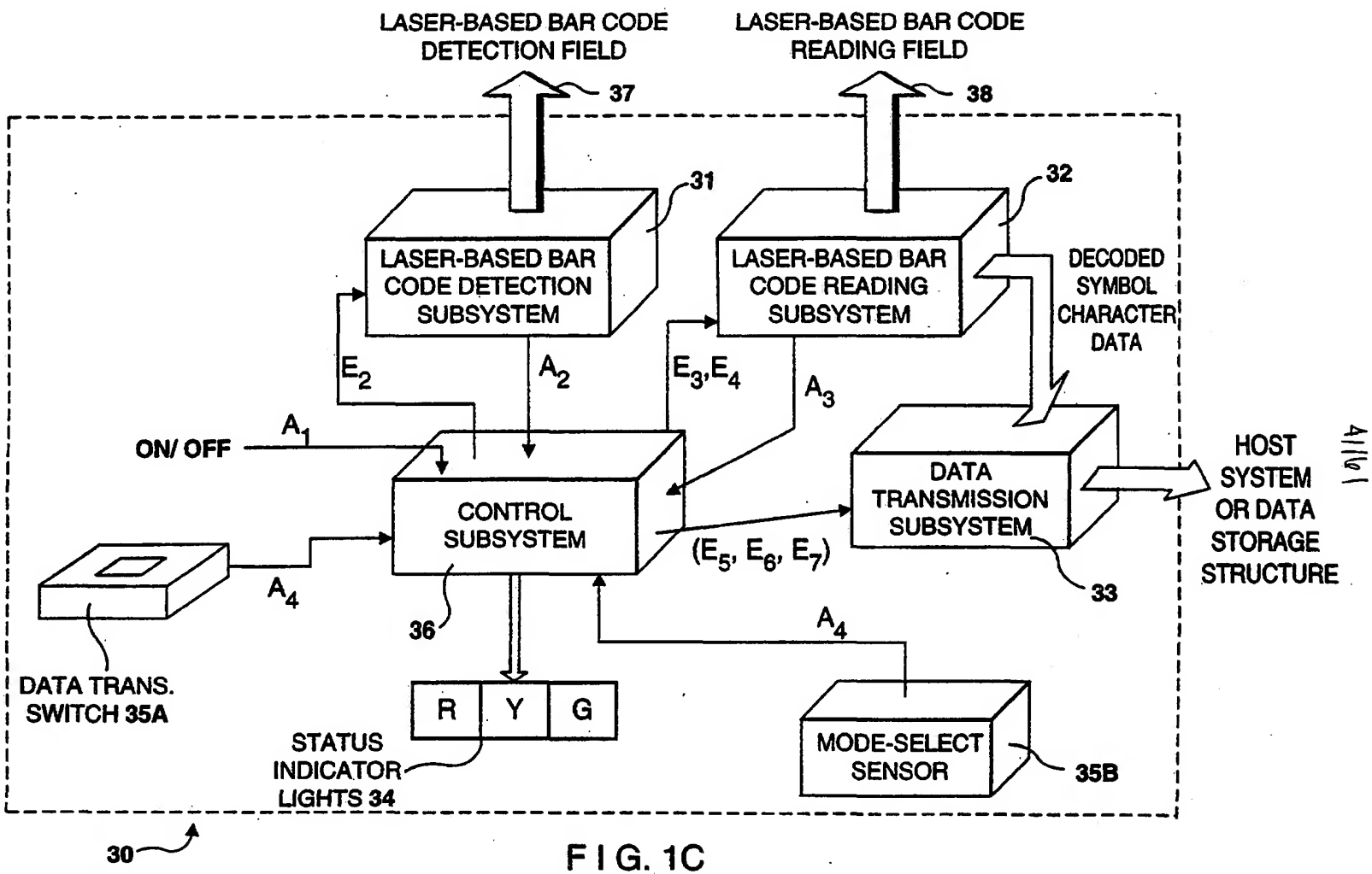

LASER-BASED BAR CODE DETECTION FIELD
37
LASER-BASED BAR CODE READING FIELD
38
31
32
LASER-BASED BAR CODE DETECTION SUBSYSTEM
LASER-BASED BAR CODE READING SUBSYSTEM
DECODED SYMBOL CHARACTER DATA
E2
A2
E3,E4
A3
A1
ON/ OFF
CONTROL SUBSYSTEM
DATA TRANSMISSION SUBSYSTEM
HOST SYSTEM OR DATA STORAGE STRUCTURE
(E5, E6, E7)
33
A4
A4
36
DATA TRANS. SWITCH 35A
R
Y
G
STATUS INDICATOR LIGHTS 34
MODE-SELECT SENSOR
35B
30

FIG. 1C

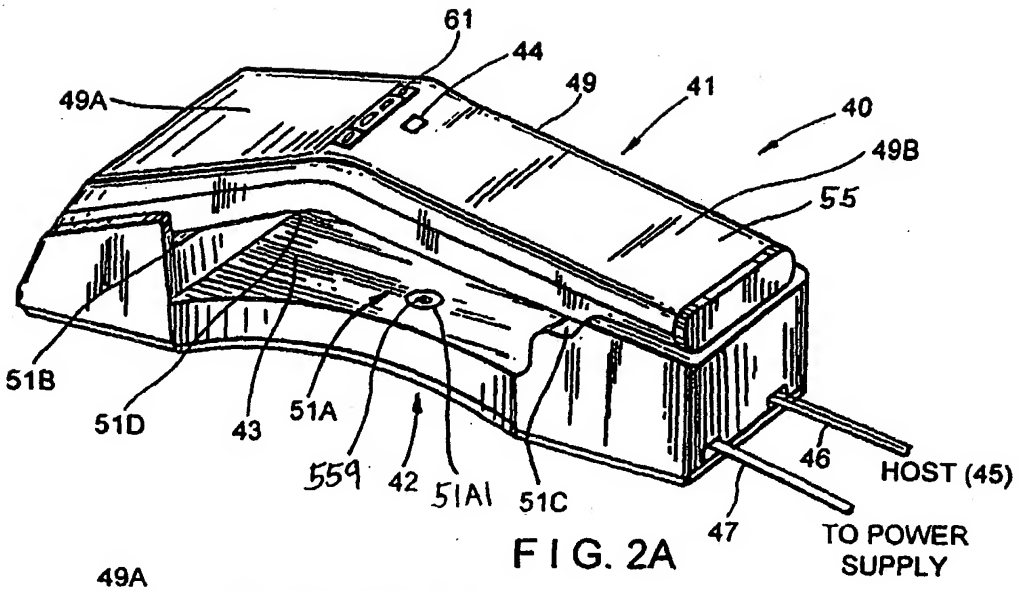


FIG. 2A

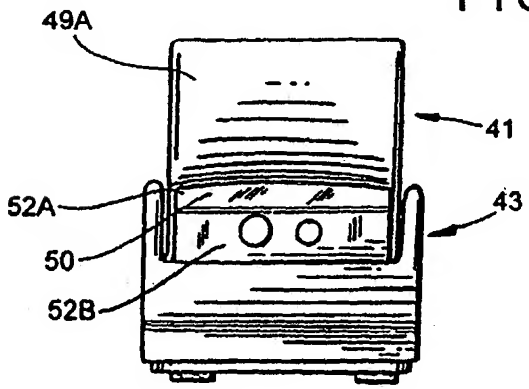


FIG. 2B

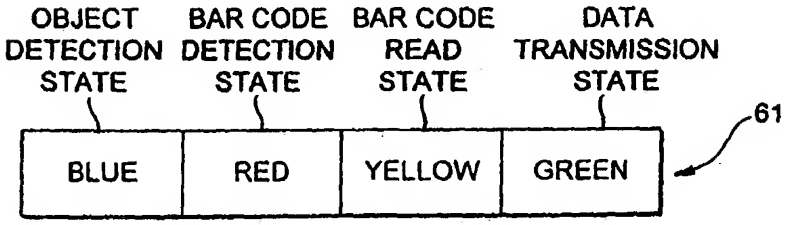


FIG. 2C

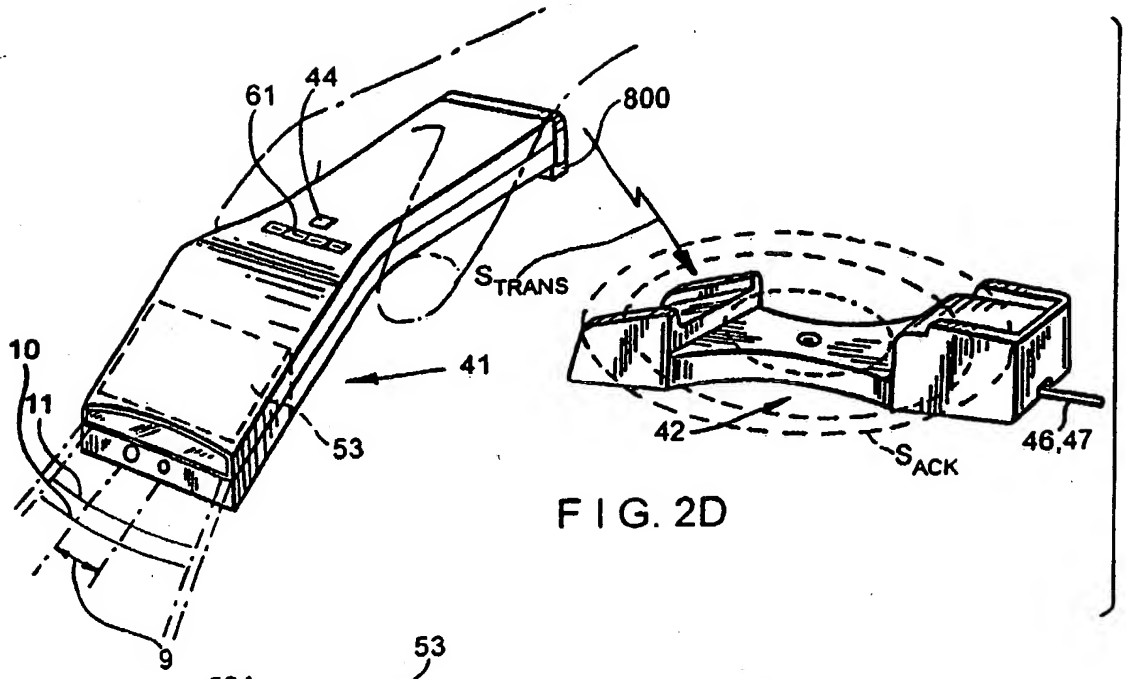


FIG. 2D

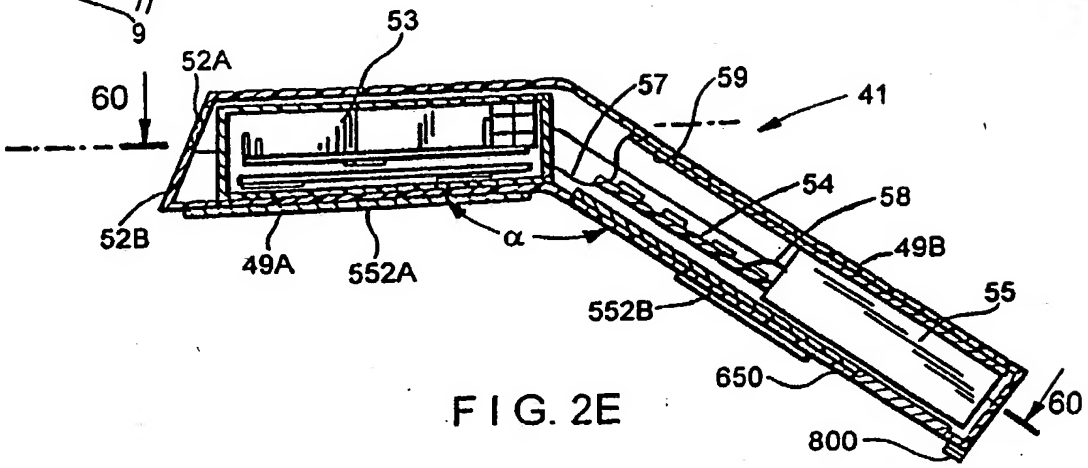


FIG. 2E

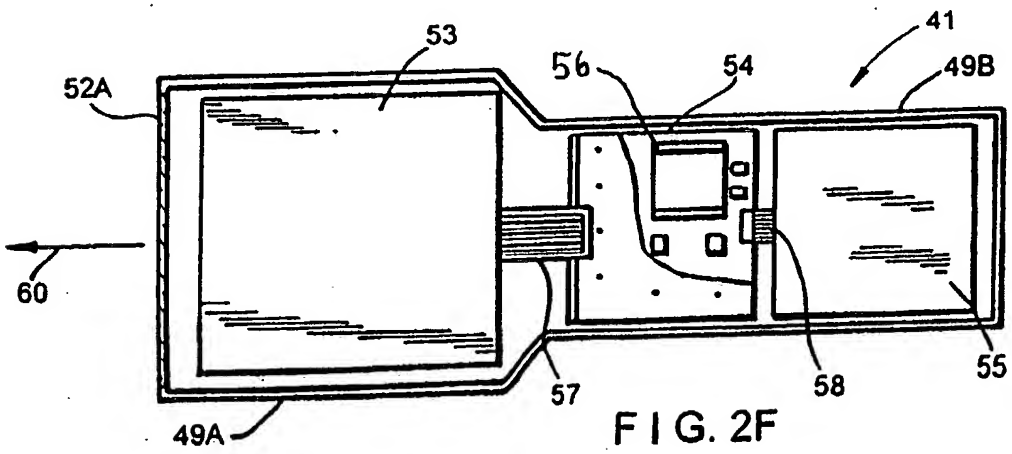


FIG. 2F

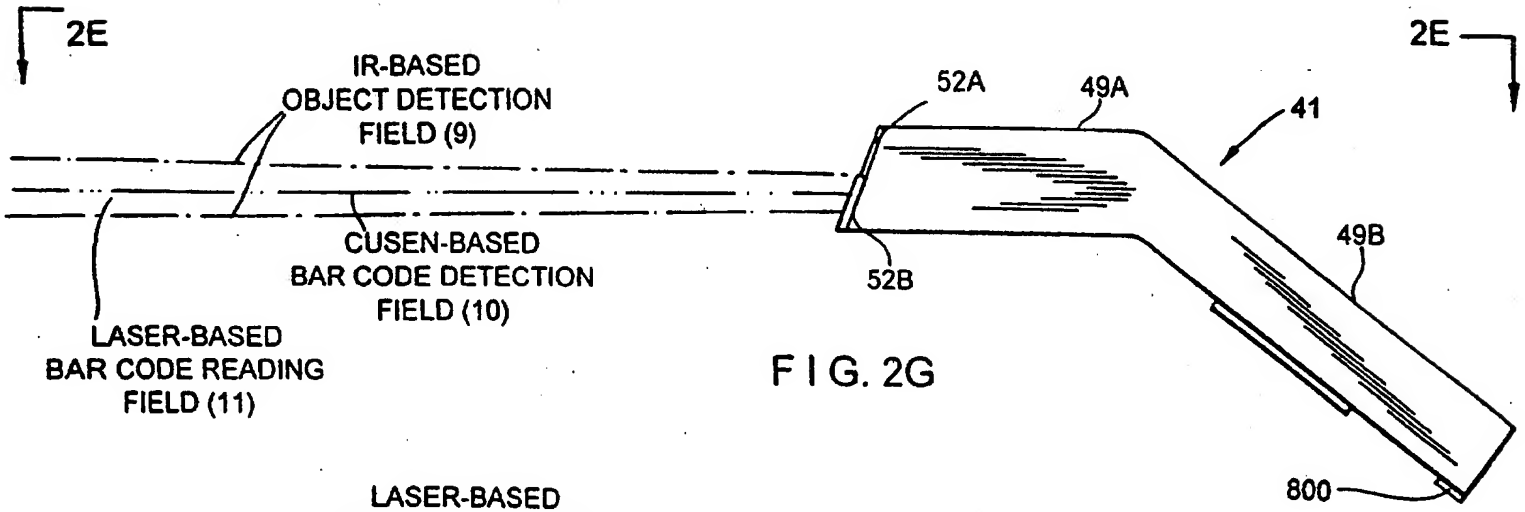

2E
IR-BASED
OBJECT DETECTION
FIELD (9)
CUSEN-BASED
BAR CODE DETECTION
FIELD (10)
LASER-BASED
BAR CODE READING
FIELD (11)
52A
49A
41
52B
49B
2E
800

FIG. 2G

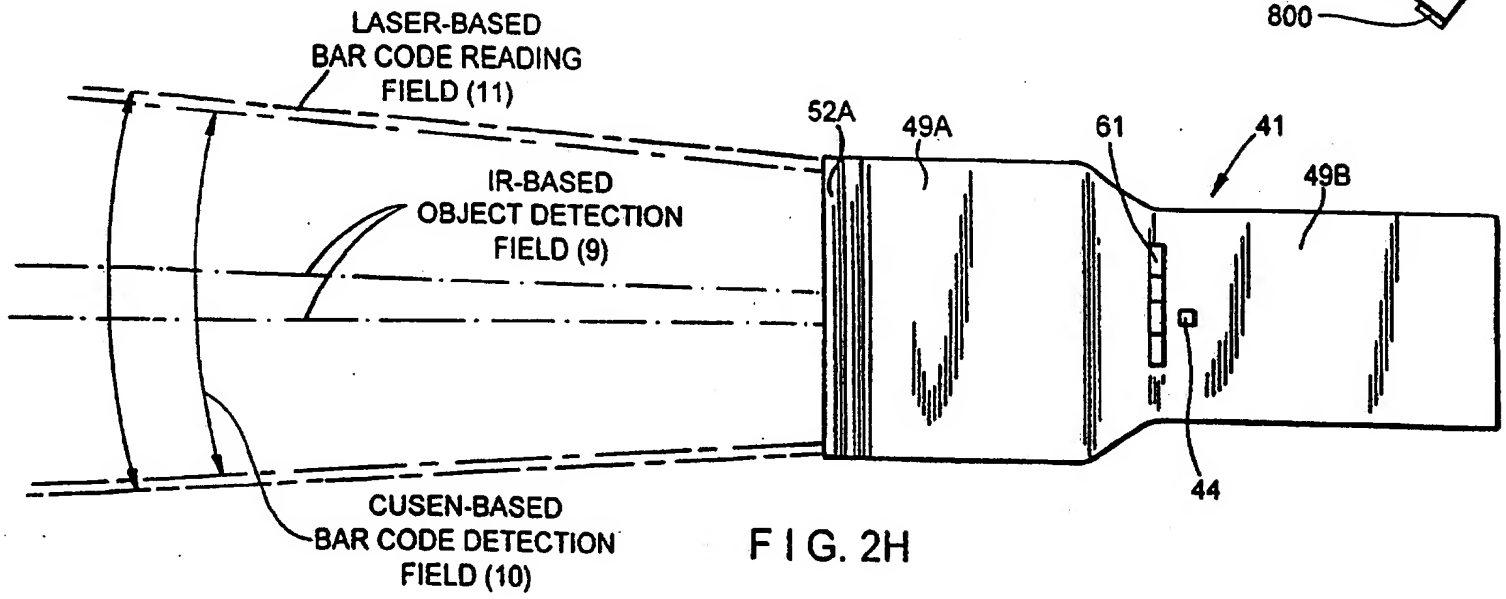

LASER-BASED
BAR CODE READING
FIELD (11)
IR-BASED
OBJECT DETECTION
FIELD (9)
CUSEN-BASED
BAR CODE DETECTION
FIELD (10)
52A
49A
61
41
49B
44

FIG. 2H

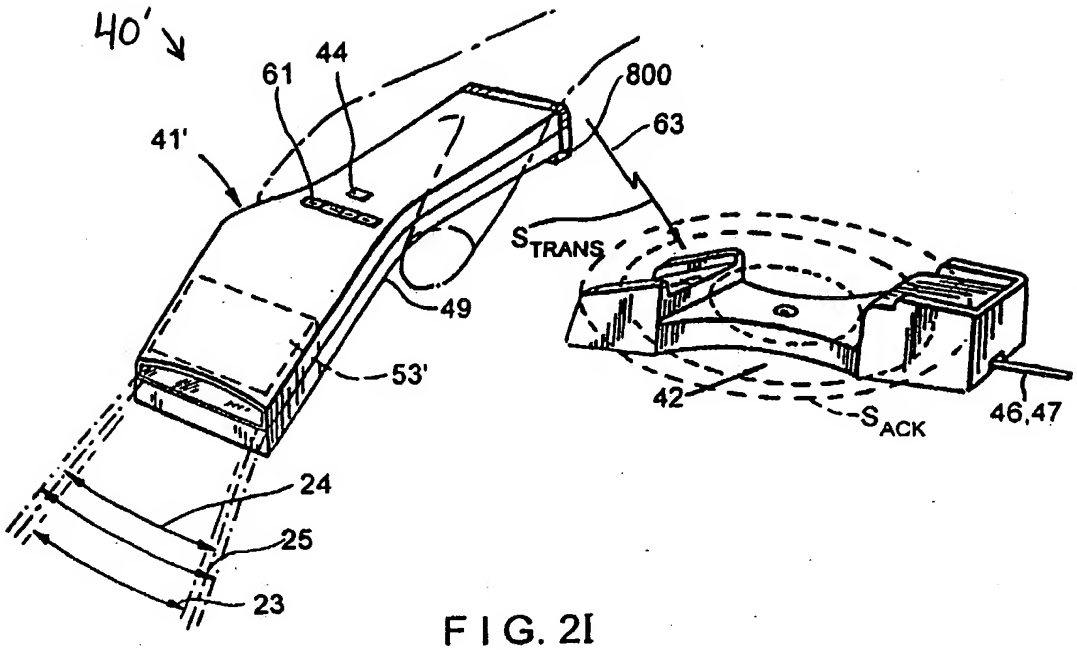

40'
61
44
800
63
41'
S_{TRANS}
49
53'
42
S_{ACK}
46,47
24
25
23

FIG. 2I

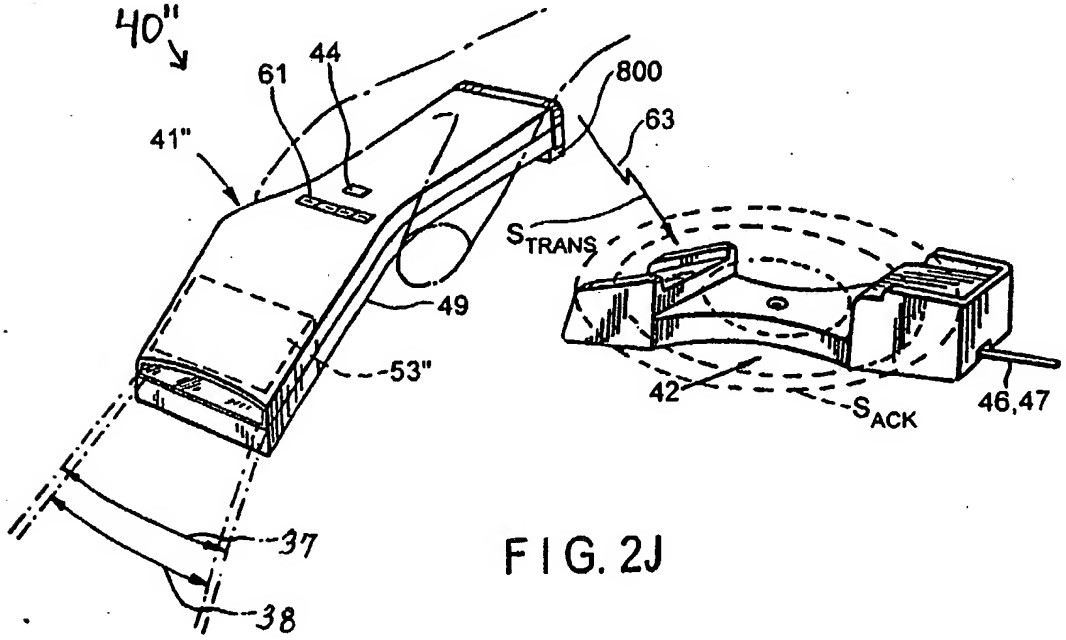

40"
61
44
800
63
41"
S_{TRANS}
49
53"
42
S_{ACK}
46,47
37
38

FIG. 2J

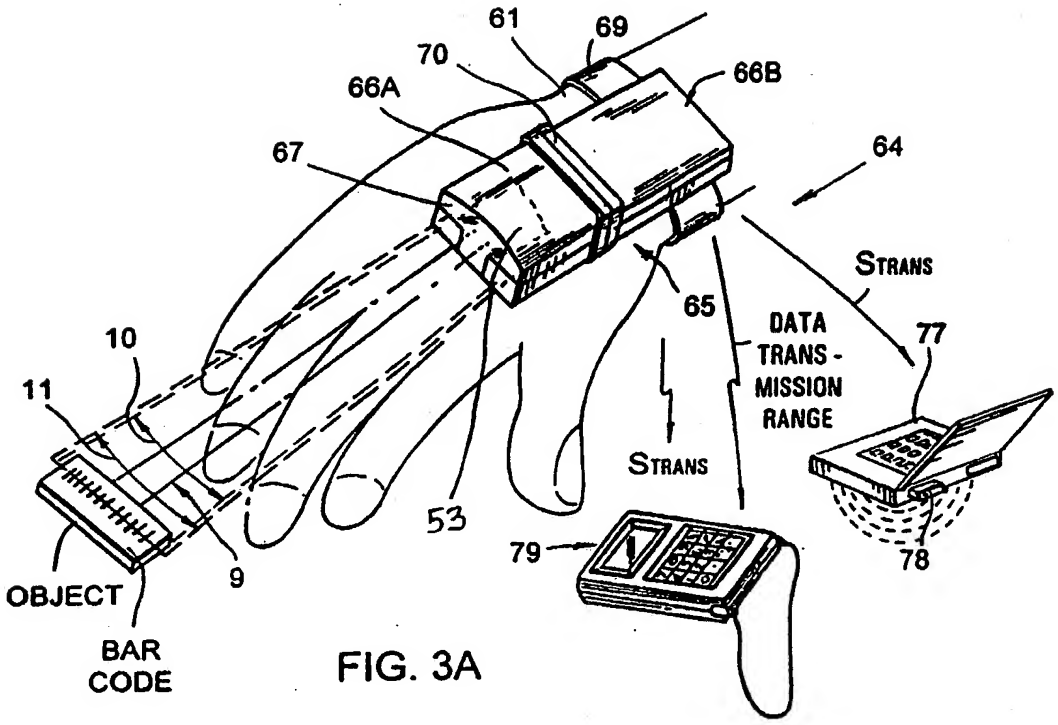


FIG. 3A

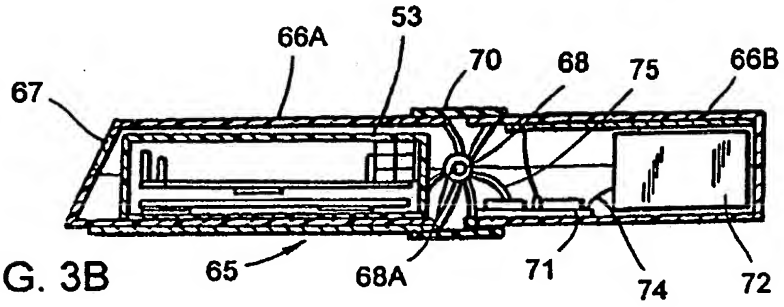


FIG. 3B

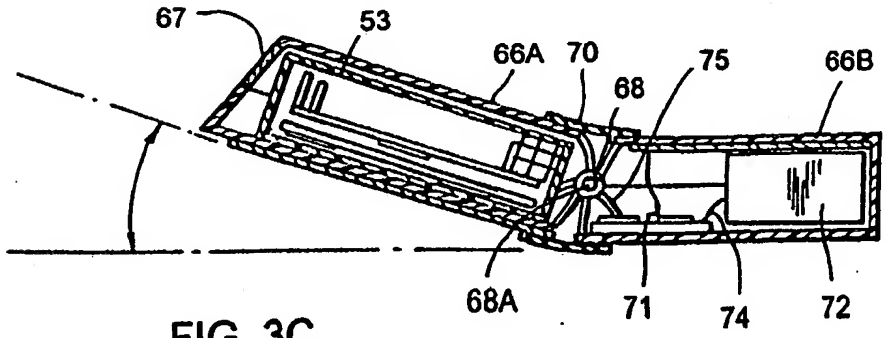


FIG. 3C

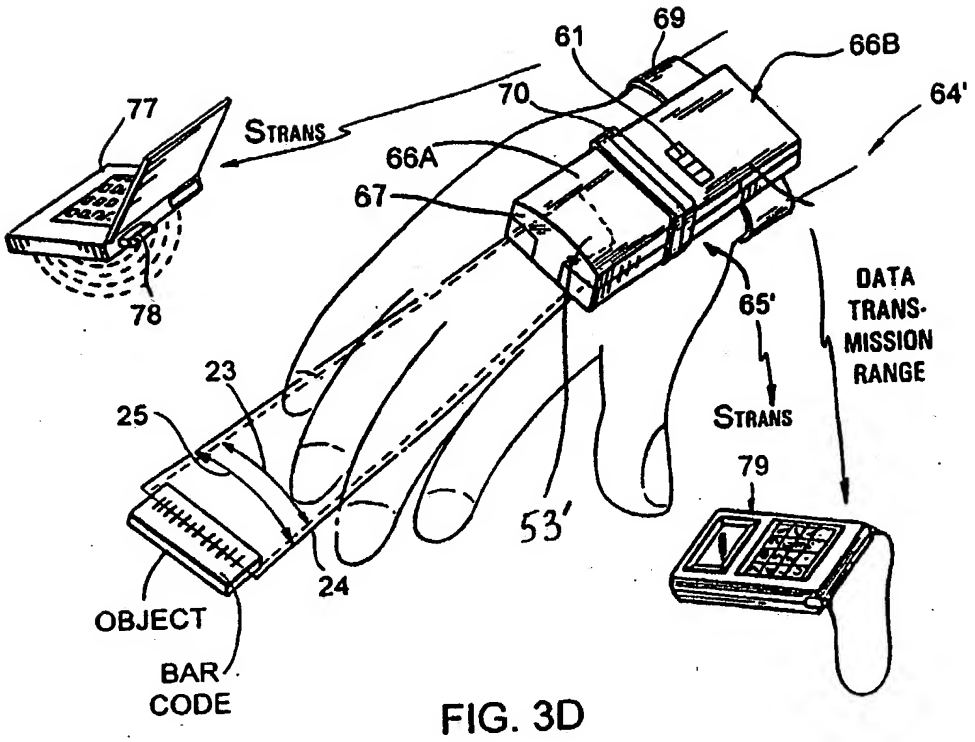

61
69
66B
64'
70
77
STRANS
66A
67
65'
DATA
TRANS-
MISSION
RANGE
78
23
25
STRANS
79
53'
24
OBJECT
BAR
CODE

FIG. 3D

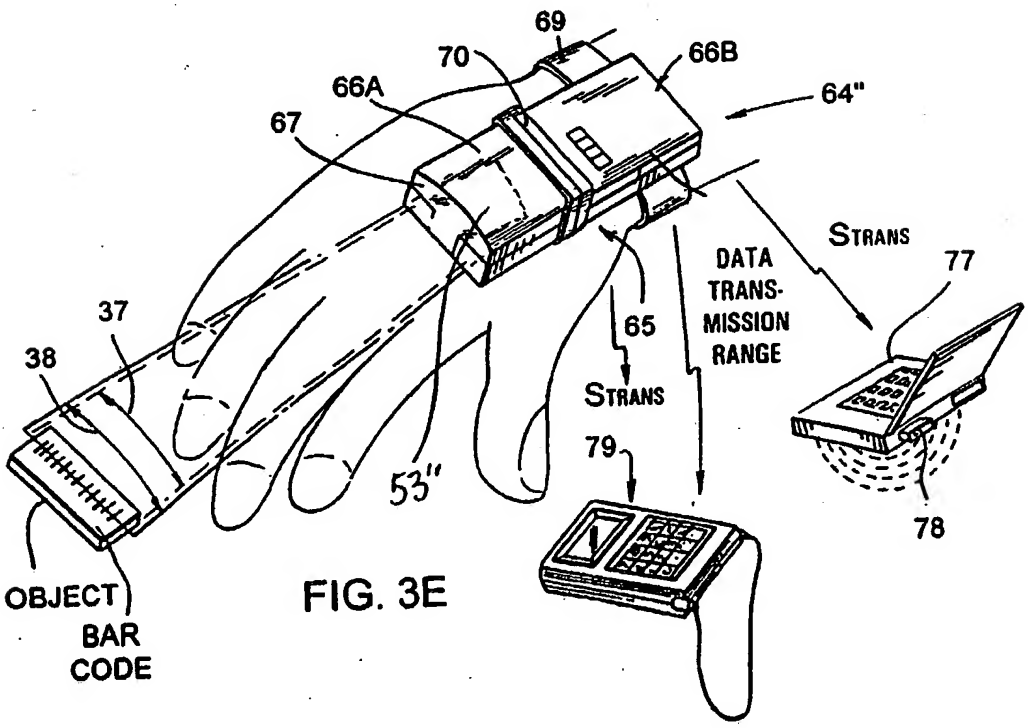

69
70
66B
66A
64"
67
STRANS
77
DATA
TRANS-
MISSION
RANGE
37
65
38
STRANS
79
53"
78
OBJECT
BAR
CODE

FIG. 3E

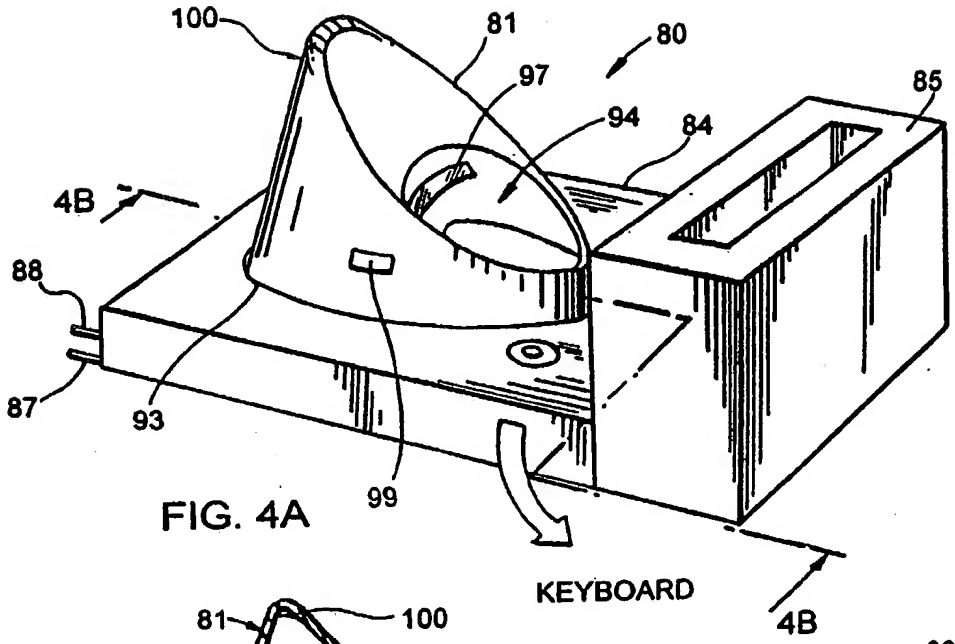


FIG. 4A

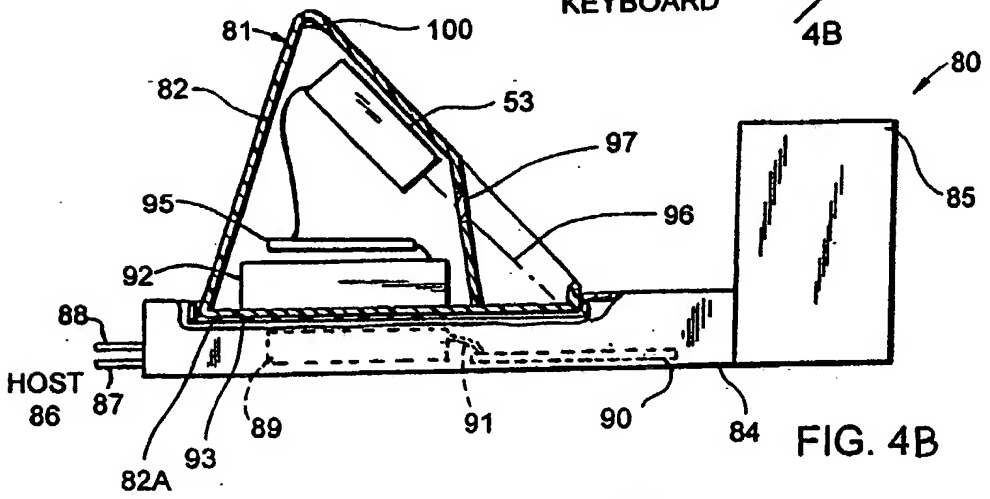


FIG. 4B

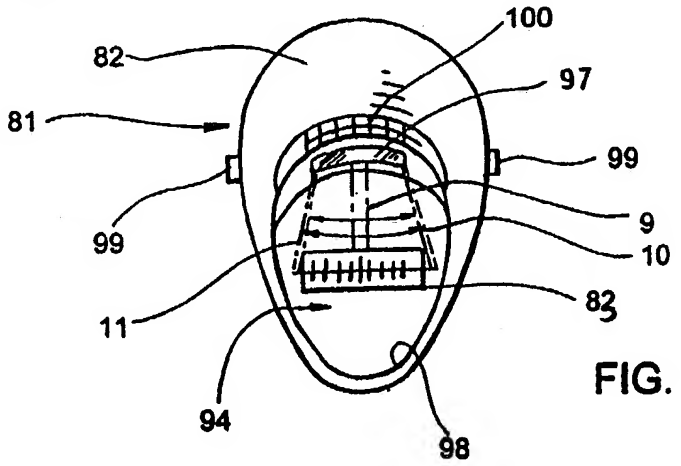


FIG. 4C

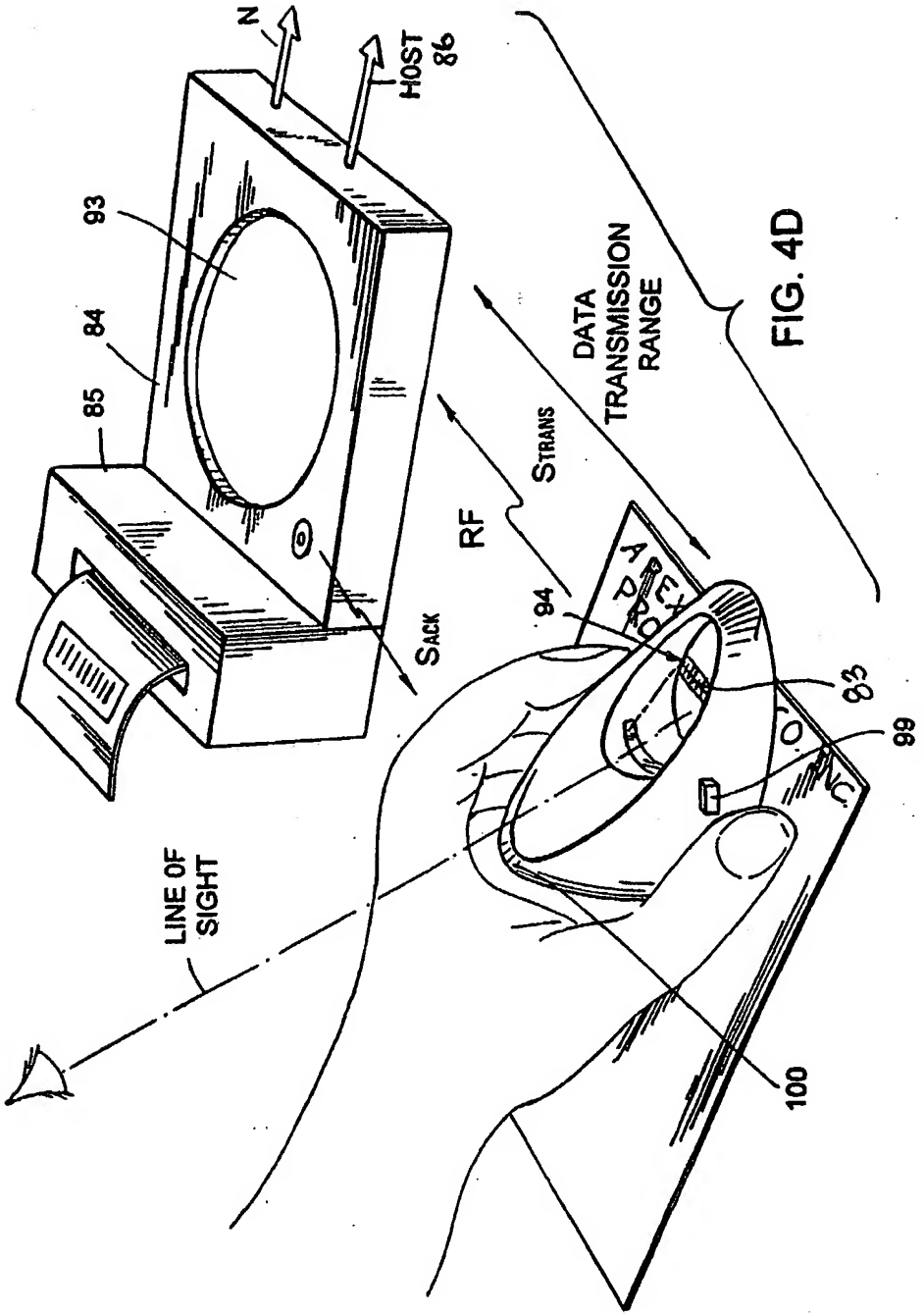

N
HOST
86
93
84
85
SACK
RF
STRANS
DATA
TRANSMISSION
RANGE
94
83
99
100
LINE OF
SIGHT

FIG. 4D

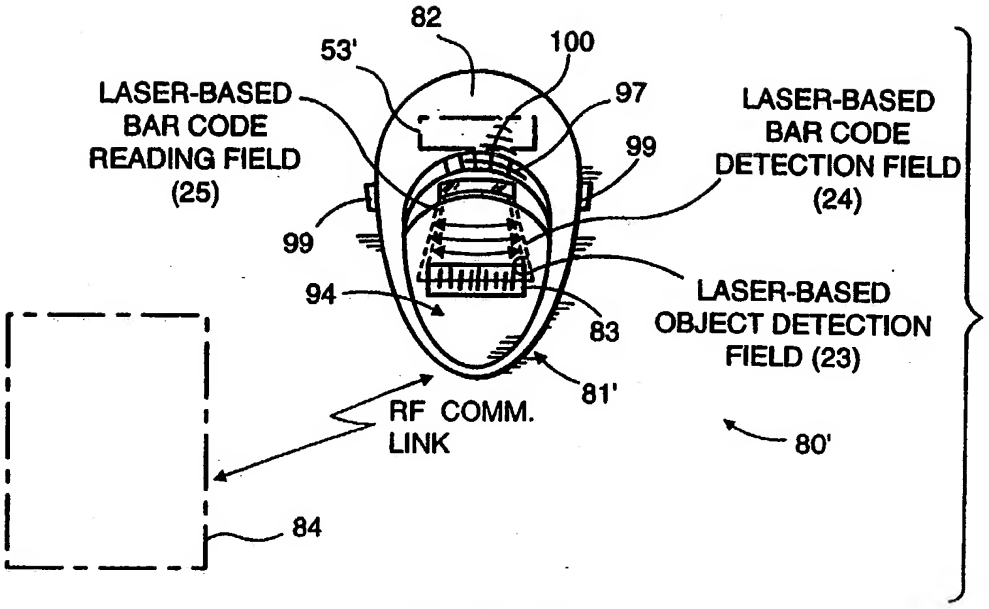

82
53'
100
97
99
LASER-BASED
BAR CODE
READING FIELD
(25)
LASER-BASED
BAR CODE
DETECTION FIELD
(24)
99
94
83
LASER-BASED
OBJECT DETECTION
FIELD (23)
81'
RF COMM.
LINK
80'
84

FIG. 4E

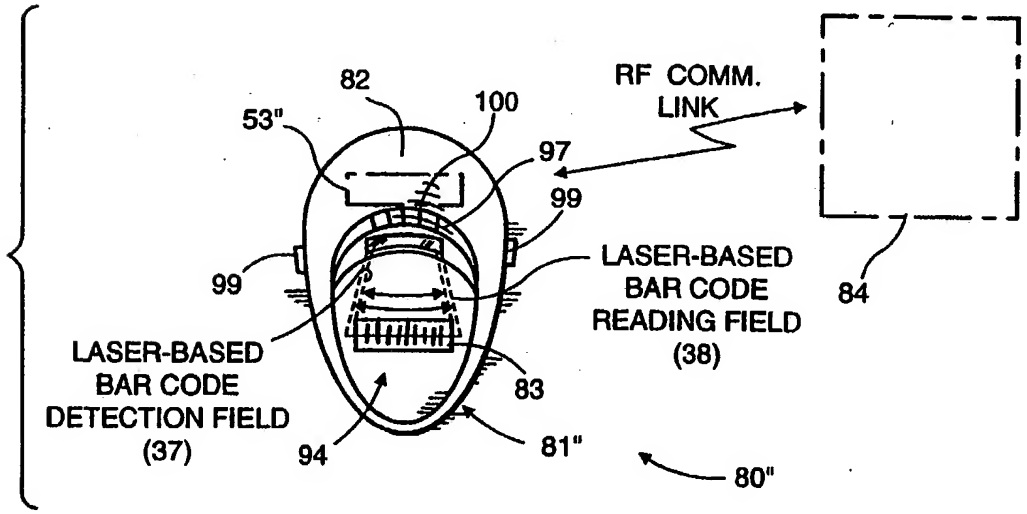

82
53"
100
RF COMM.
LINK
97
99
99
LASER-BASED
BAR CODE
READING FIELD
(38)
84
LASER-BASED
BAR CODE
DETECTION FIELD
(37)
83
94
81"
80"

FIG. 4F

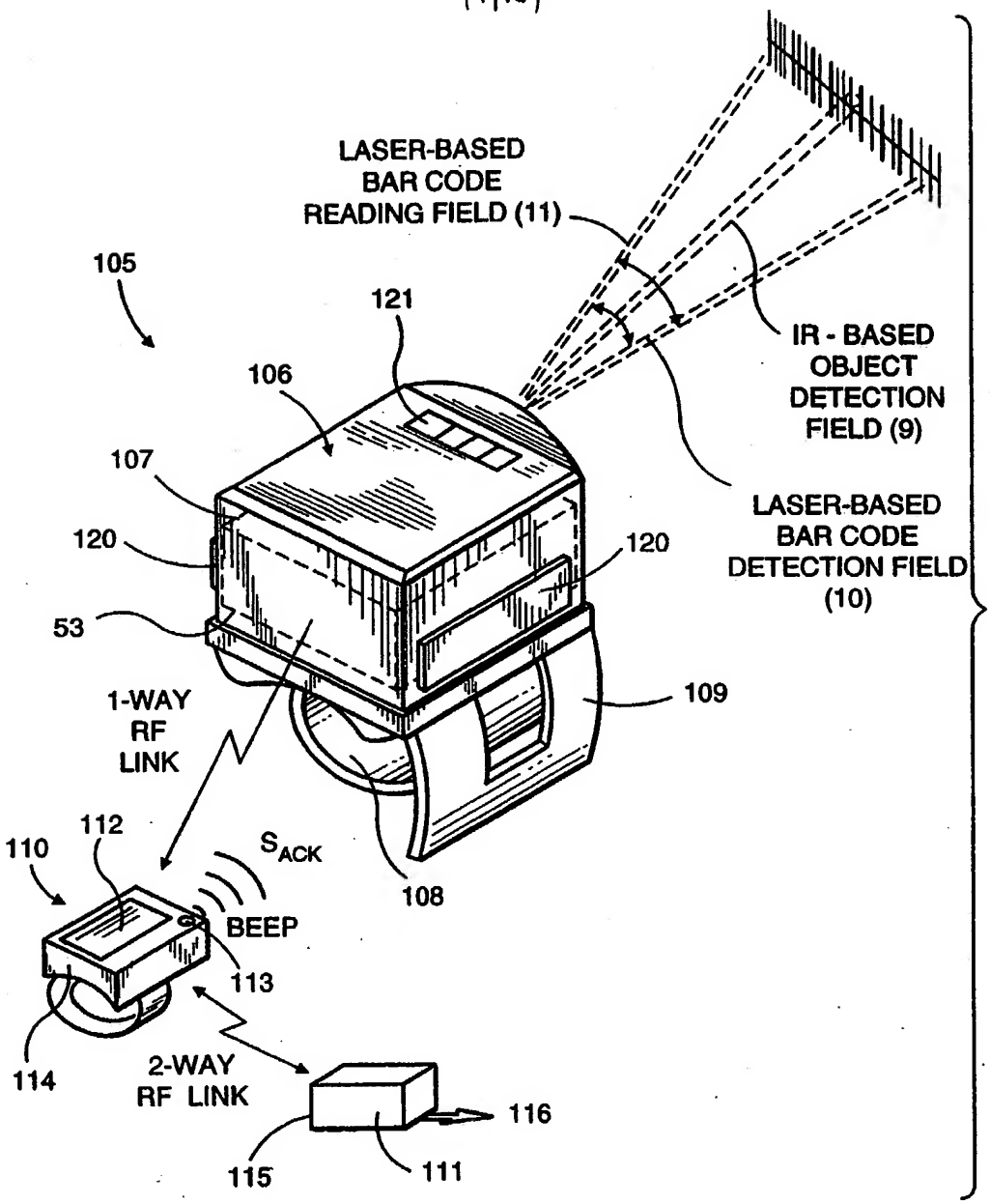

LASER-BASED
BAR CODE
READING FIELD (11)
105
121
106
IR - BASED
OBJECT
DETECTION
FIELD (9)
107
LASER-BASED
BAR CODE
DETECTION FIELD
(10)
120
120
53
109
1-WAY
RF
LINK
112
110
S_{ACK}
108
BEEP
113
114
2-WAY
RF LINK
116
115
111

FIG. 5A

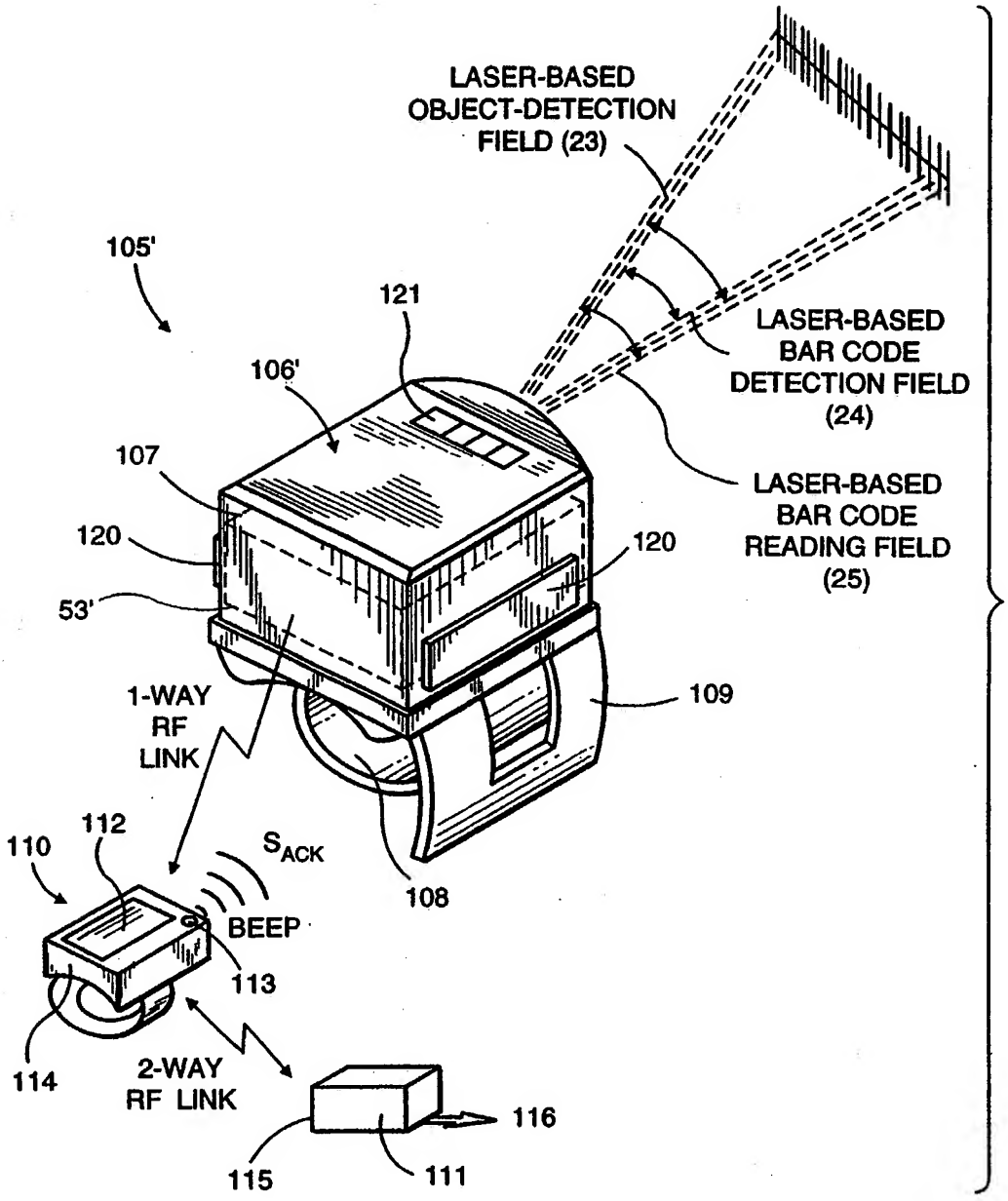

LASER-BASED
OBJECT-DETECTION
FIELD (23)
105'
121
106'
LASER-BASED
BAR CODE
DETECTION FIELD
(24)
107
LASER-BASED
BAR CODE
READING FIELD
(25)
120
120
53'
109
1-WAY
RF
LINK
112
110
S_{ACK}
BEEP
108
113
114
2-WAY
RF LINK
116
115
111

FIG. 5B

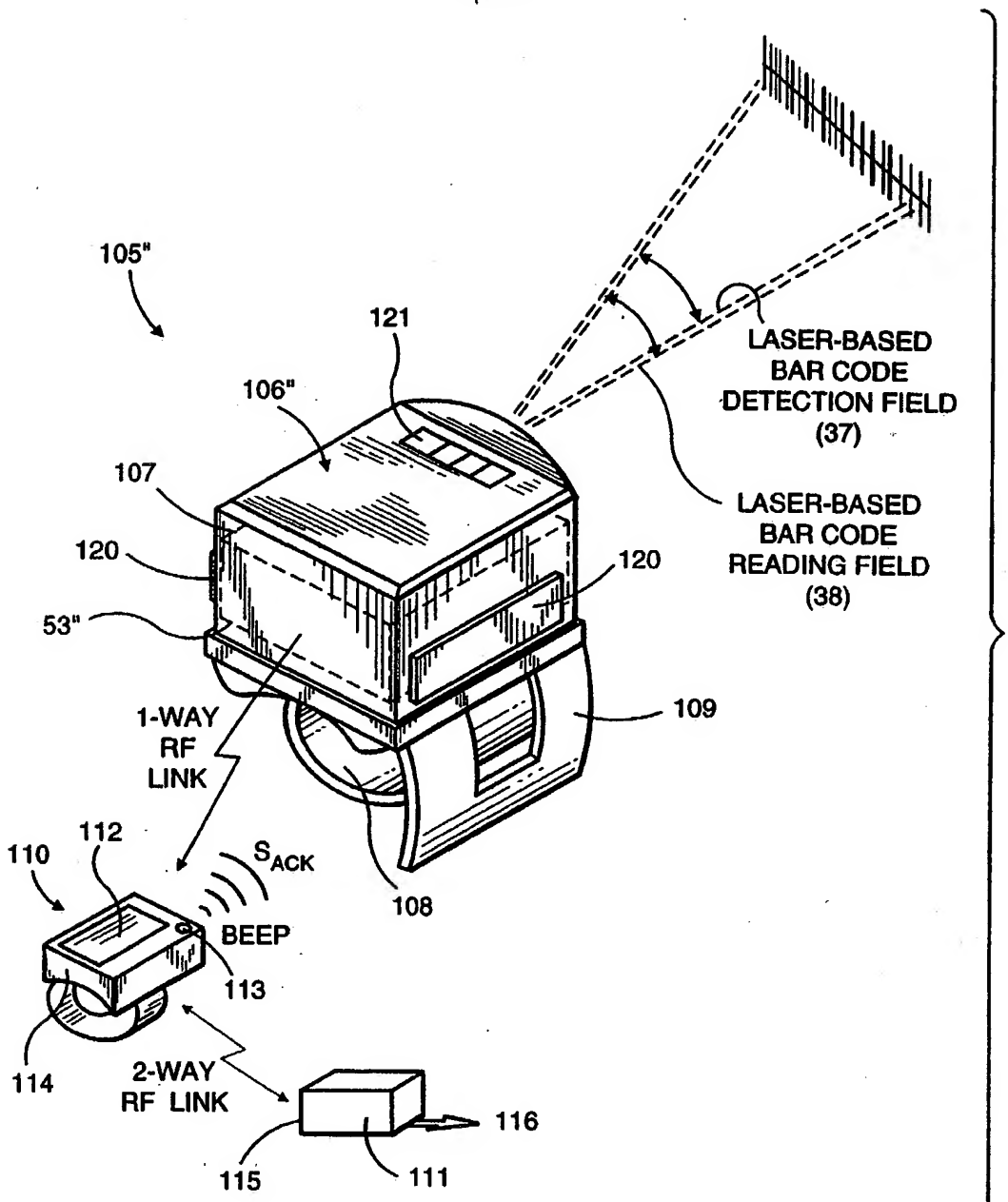

105"
121
106"
107
120
53"
120
109
1-WAY
RF
LINK
112
110
S_{ACK}
BEEP
113
108
114
2-WAY
RF LINK
116
115
111
LASER-BASED
BAR CODE
DETECTION FIELD
(37)
LASER-BASED
BAR CODE
READING FIELD
(38)

FIG. 5C

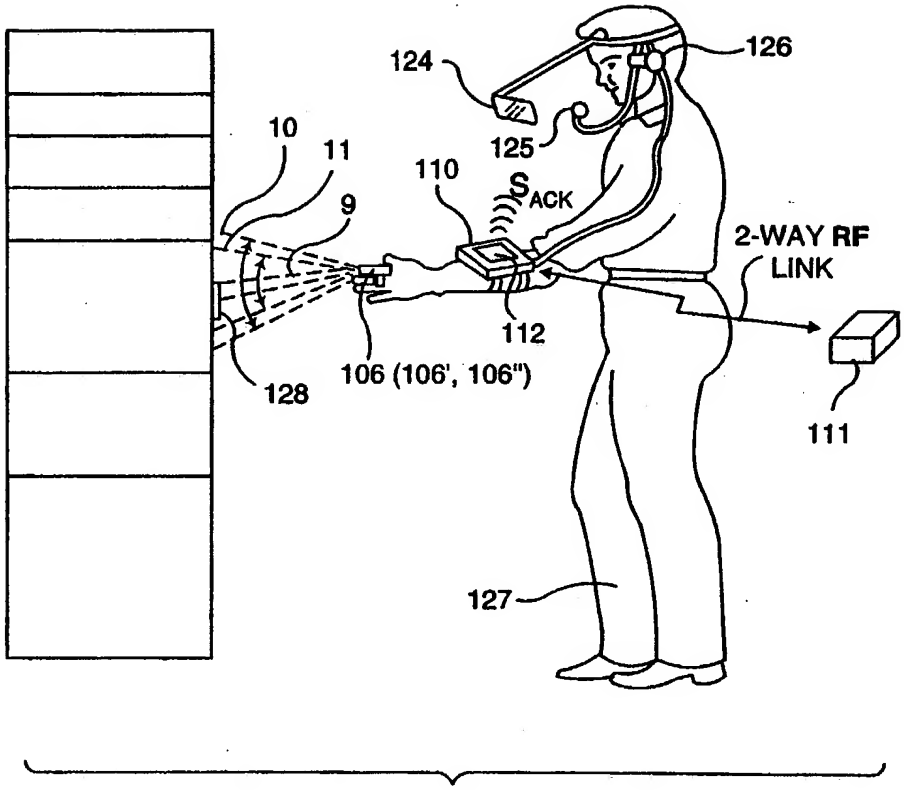

124
126
125
10
11
110
9
S_{ACK}
2-WAY RF
LINK
112
106 (106', 106")
128
111
127

FIG. 5D

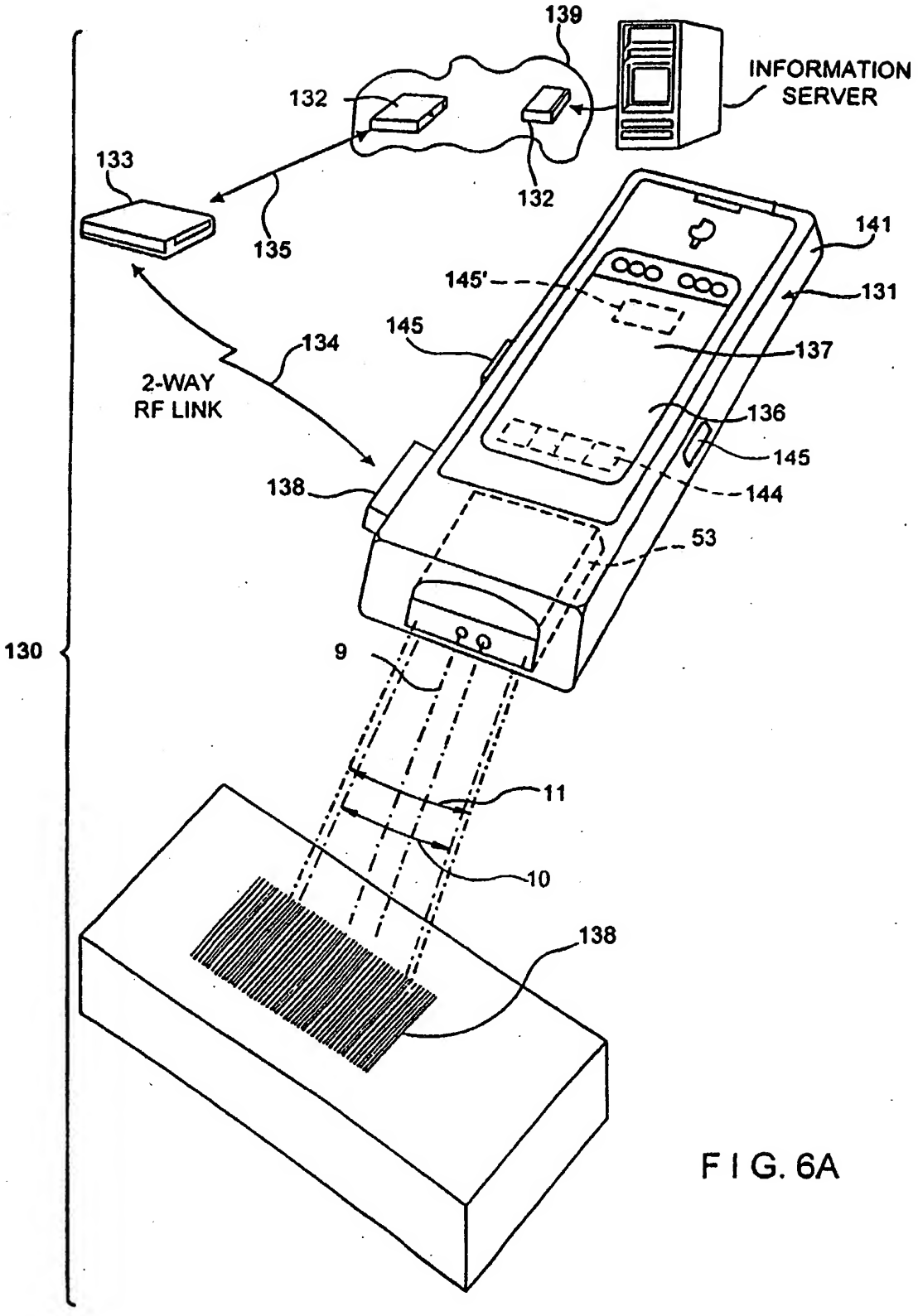

139
INFORMATION SERVER
132
132
133
135
141
145'
131
145
137
134
2-WAY RF LINK
136
145
138
144
53
130
9
11
10
138

FIG. 6A

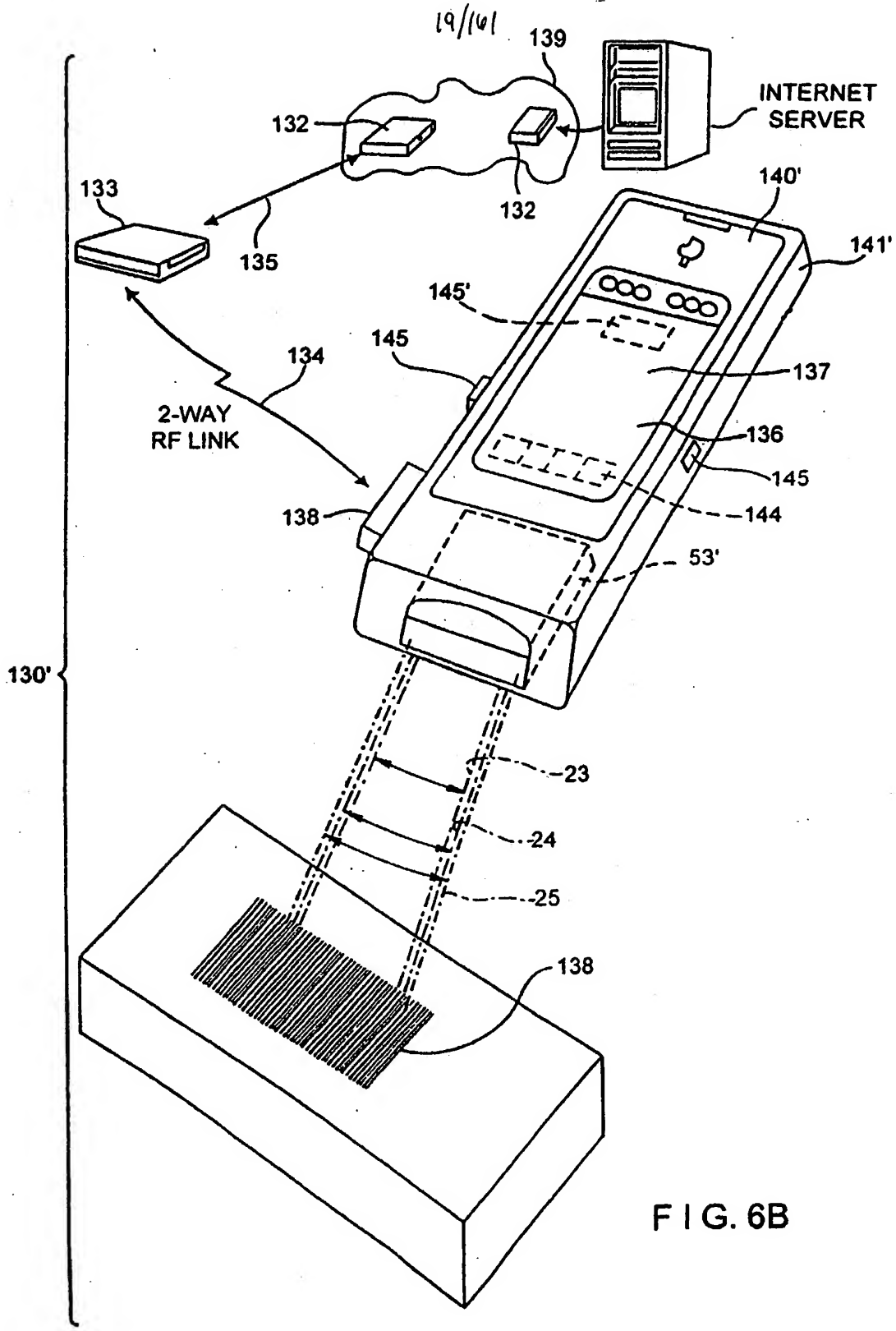

139
INTERNET SERVER
132
132
133
135
140'
141'
145'
145
134
137
2-WAY RF LINK
136
145
144
138
53'
130'
23
24
25
138

FIG. 6B

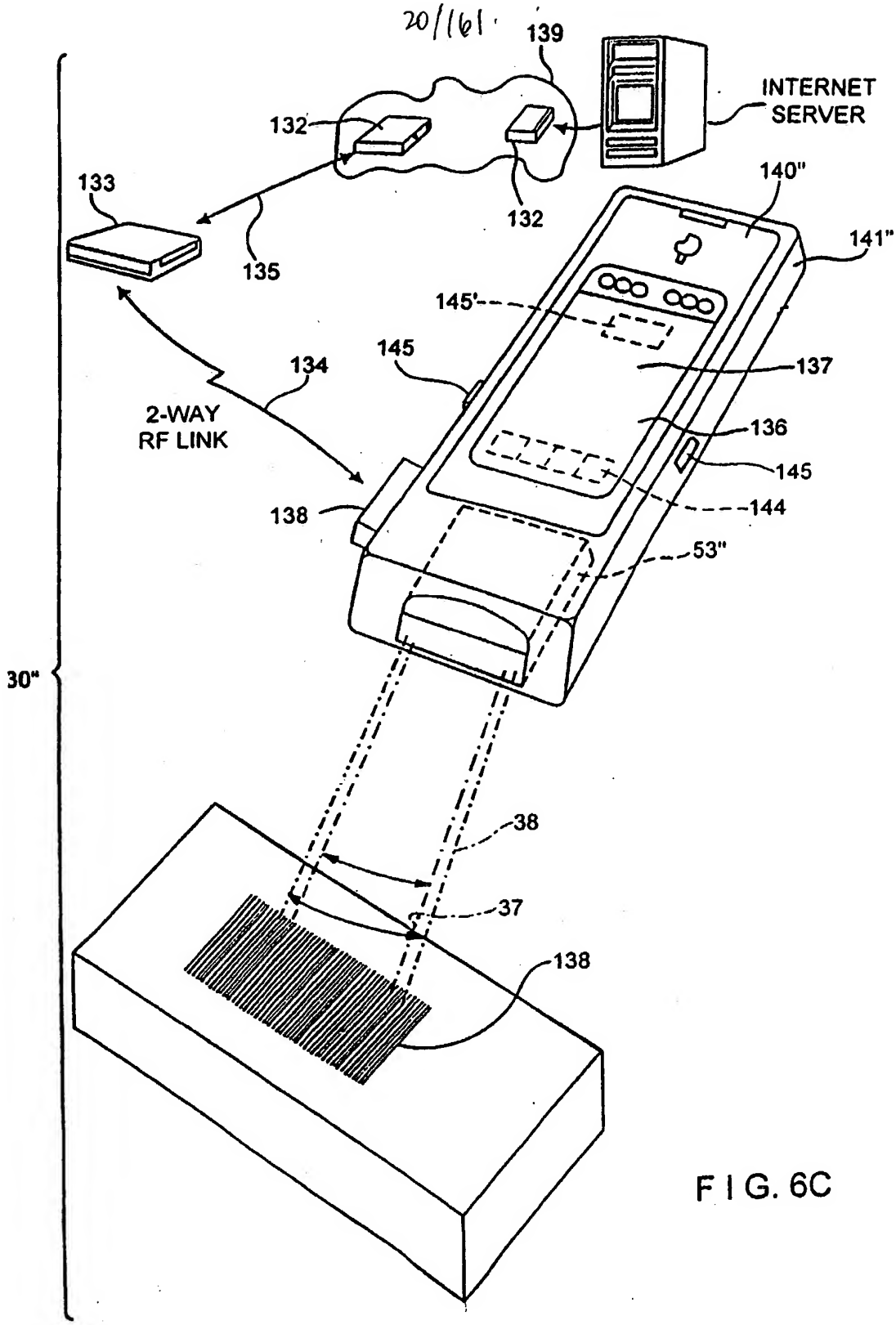

139
INTERNET SERVER
132
132
133
135
140"
141"
145'
145
137
134
2-WAY RF LINK
136
145
144
138
53"
30"
38
37
138

FIG. 6C

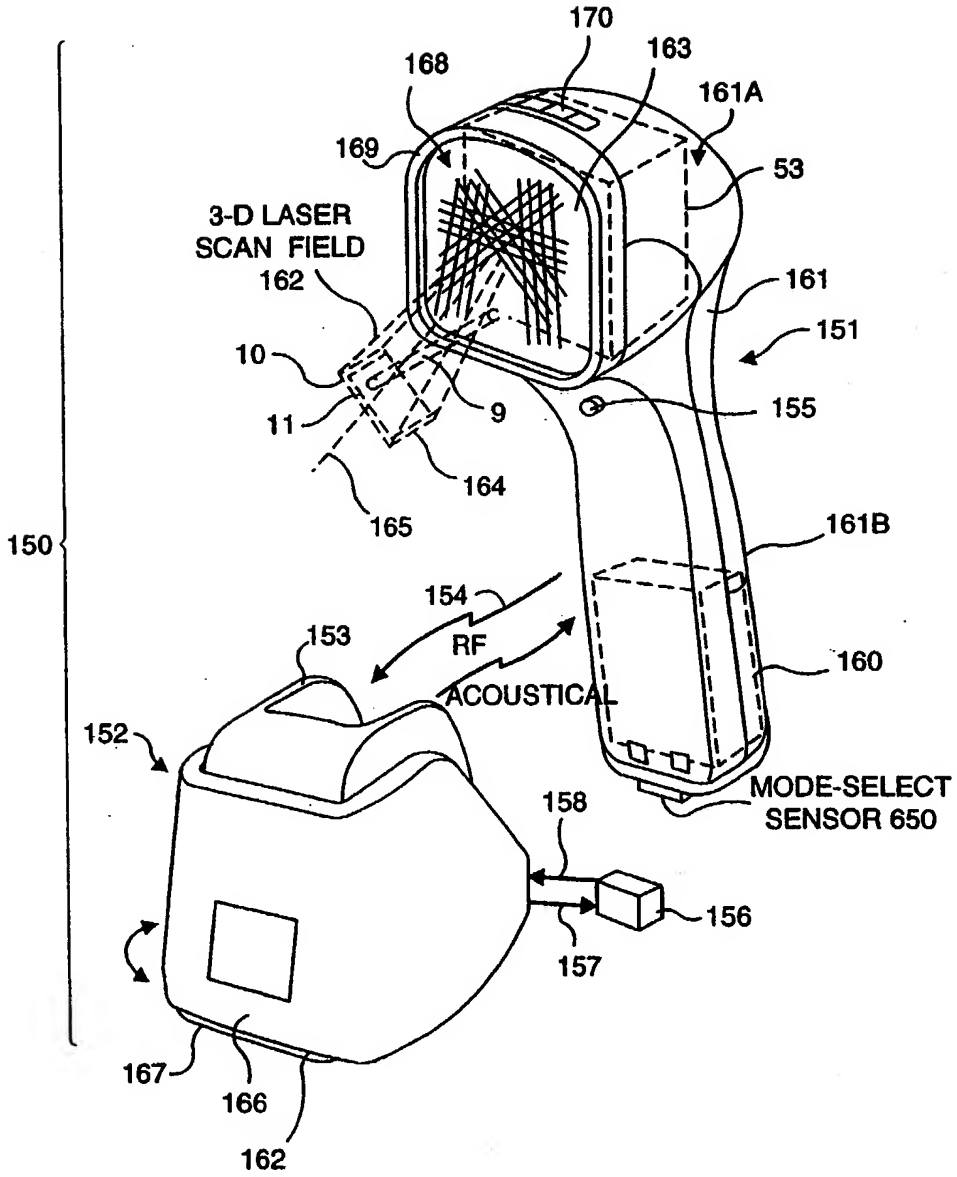

170
163
168
161A
169
53
3-D LASER
SCAN FIELD
162
161
151
10
155
11
9
164
165
150
161B
154
153
RF
ACOUSTICAL
160
152
MODE-SELECT
SENSOR 650
158
156
157
167
166
162

FIG. 7A

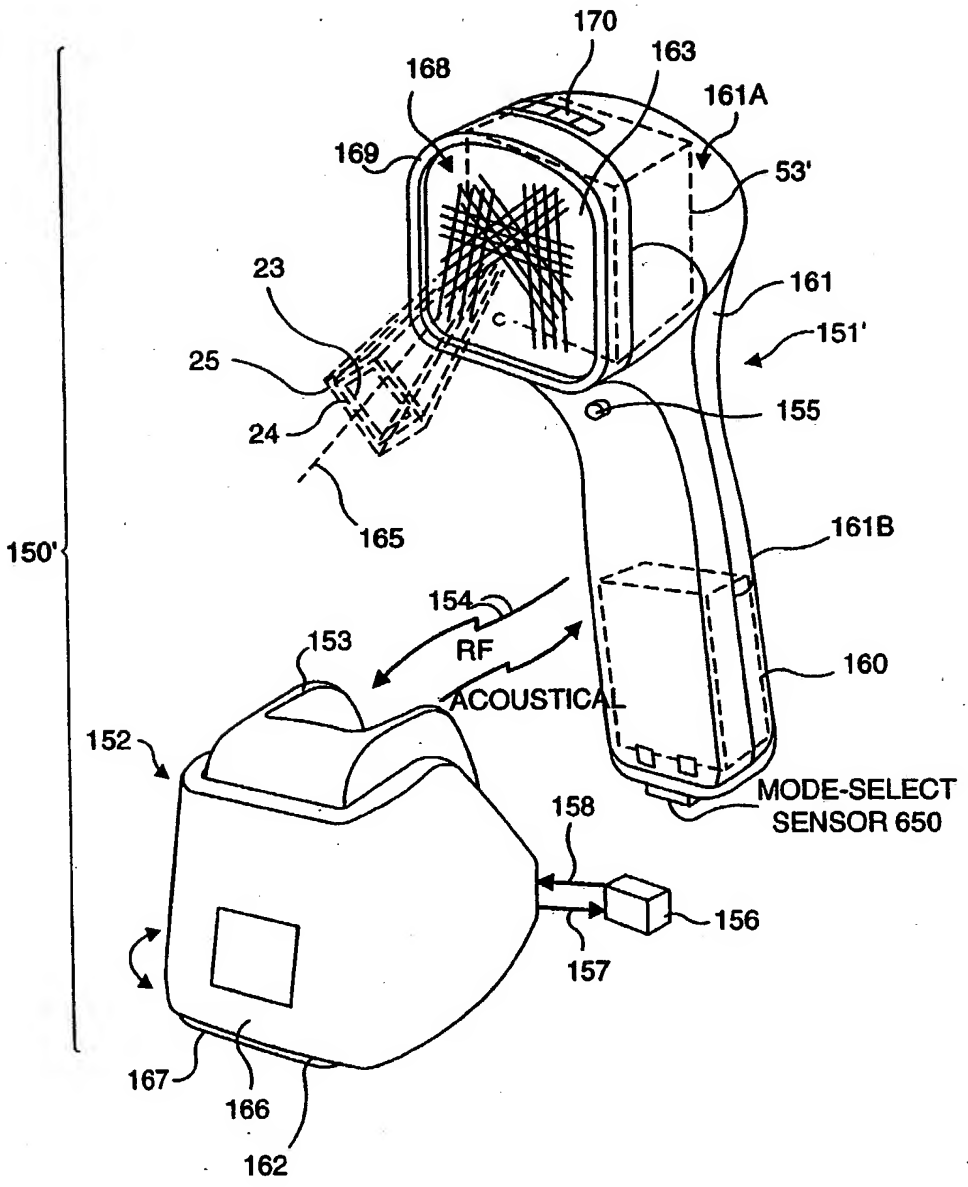

170
163
168
161A
169
53'
23
161
151'
25
155
24
165
150'
161B
154
153
RF
ACOUSTICAL
160
152
MODE-SELECT
SENSOR 650
158
156
157
167
166
162

FIG. 7B

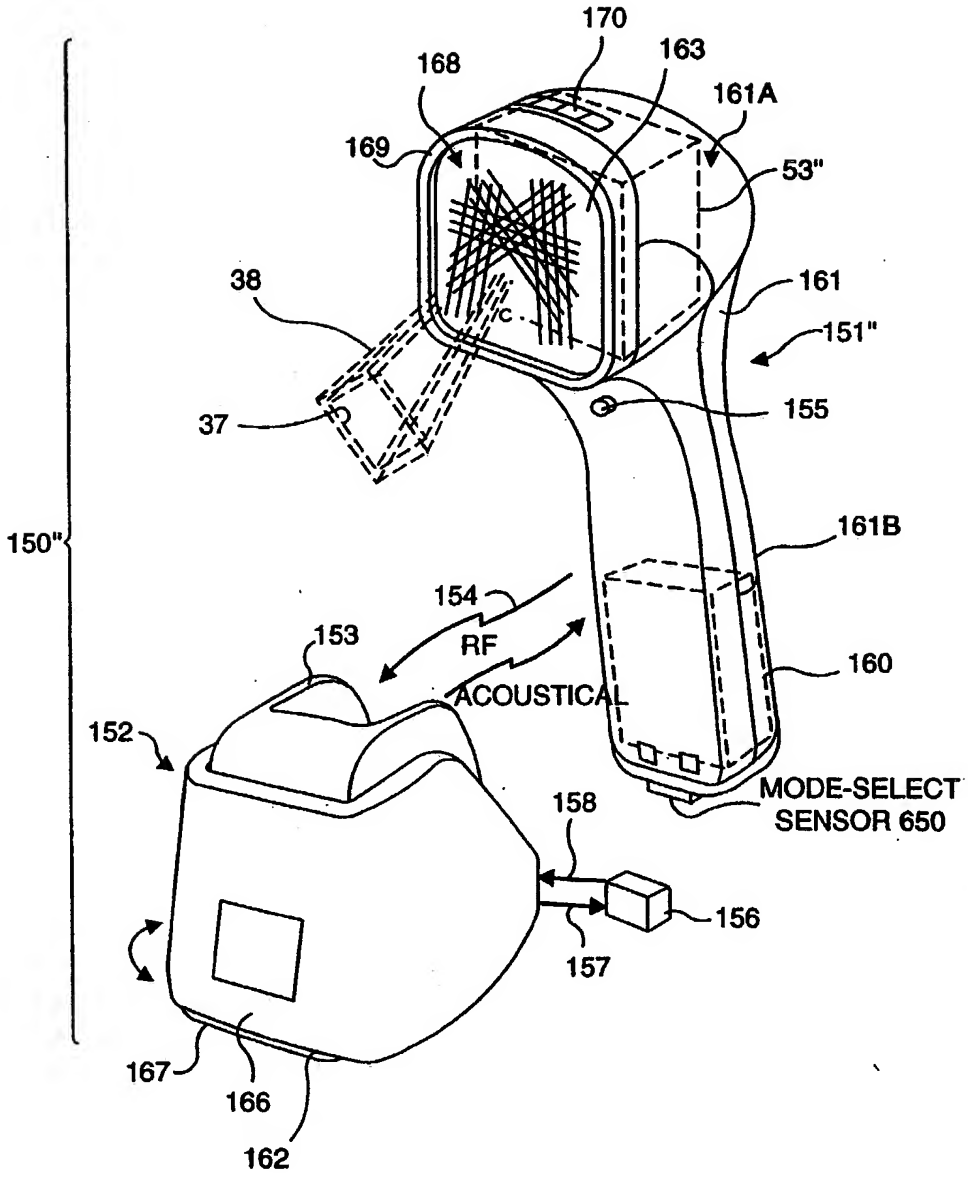

170
163
168
161A
169
53"
38
161
151"
37
155
150"
161B
154
153
RF
ACOUSTICAL
160
152
MODE-SELECT
SENSOR 650
158
156
157
167
166
162

FIG. 7C

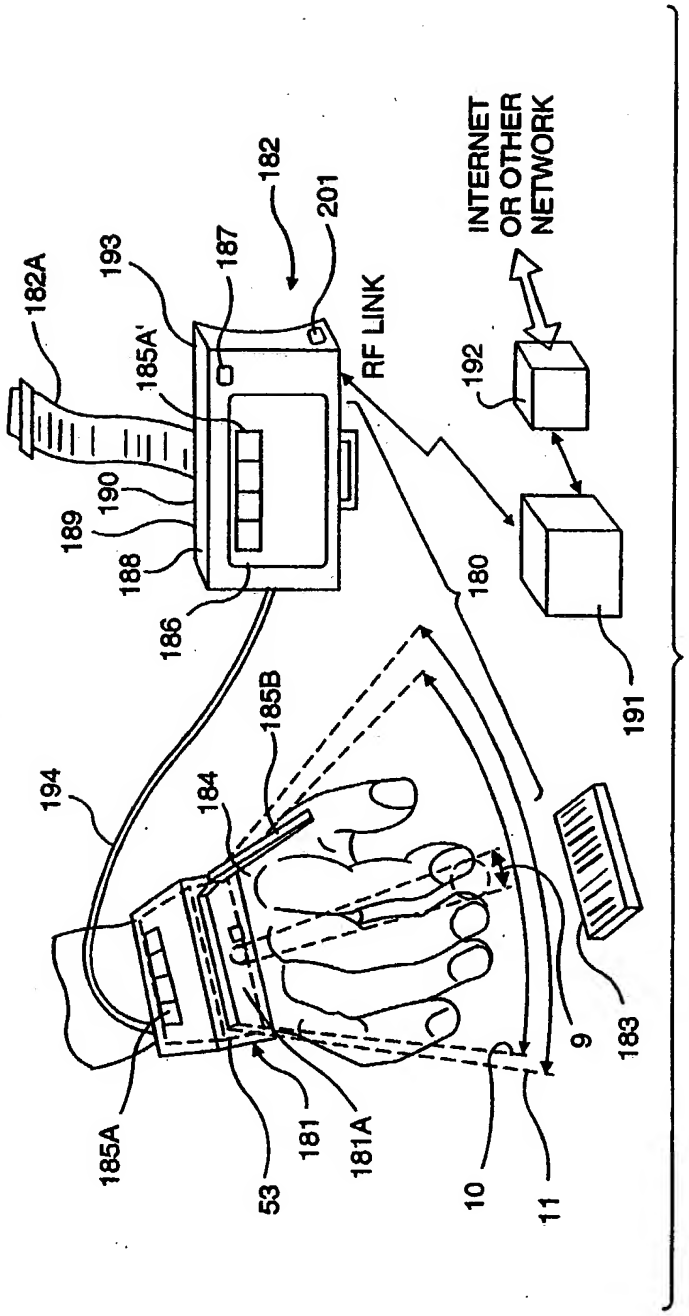

182A
193
187
182
201
185A'
INTERNET OR OTHER NETWORK
RF LINK
192
189
190
188
186
180
185B
194
184
191
185A
53
181
181A
10
11
9
183

FIG. 8A

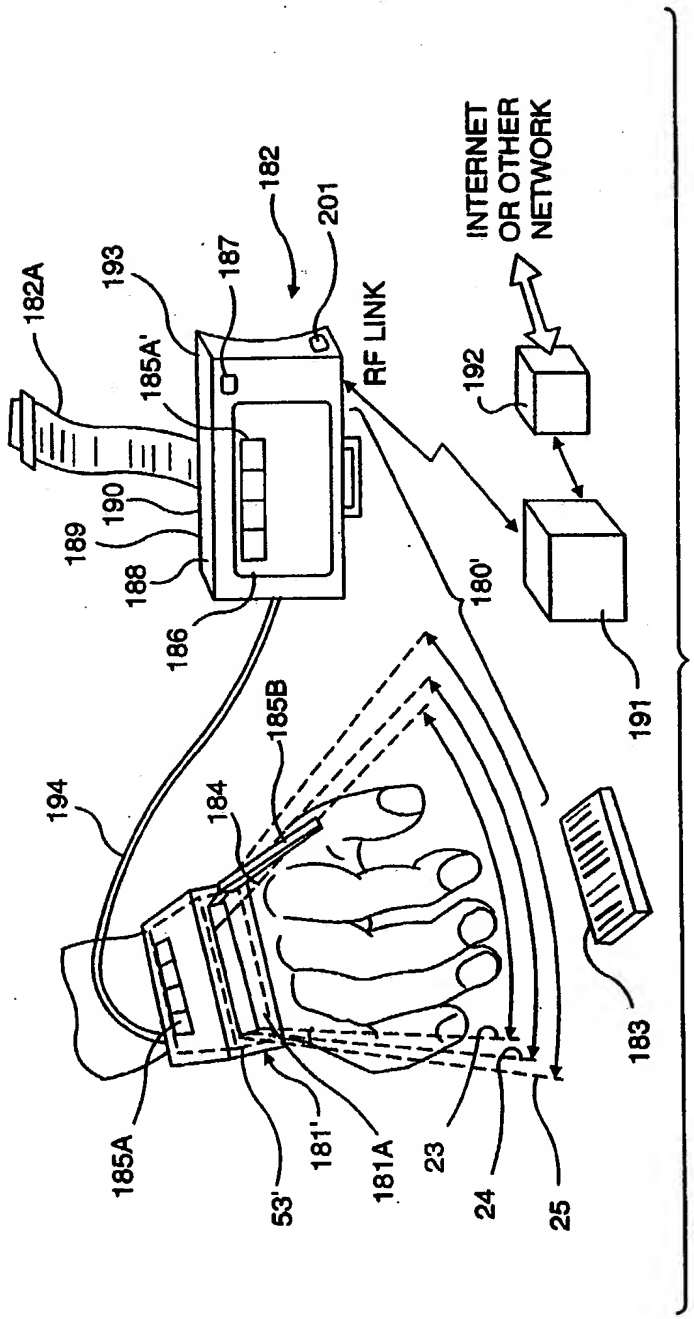

182A
193
187
182
201
185A'
INTERNET
OR OTHER
NETWORK
RF LINK
192
190
189
188
186
180'
185B
194
184
191
183
185A
181'
181A
23
53'
24
25

FIG. 8B

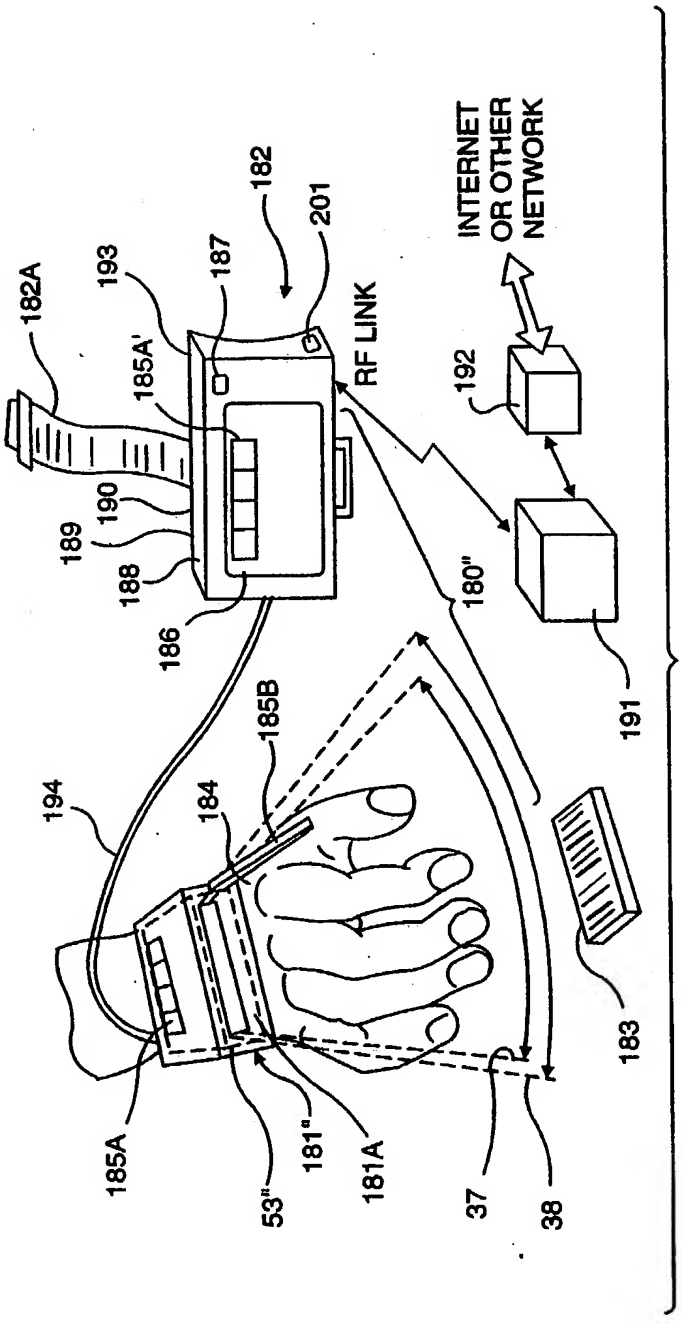

182A
193
187
182
201
185A'
INTERNET
OR OTHER
NETWORK
RF LINK
192
190
189
188
186
180"
185B
194
184
191
185A
181"
181A
53"
37
38
183

FIG. 8C

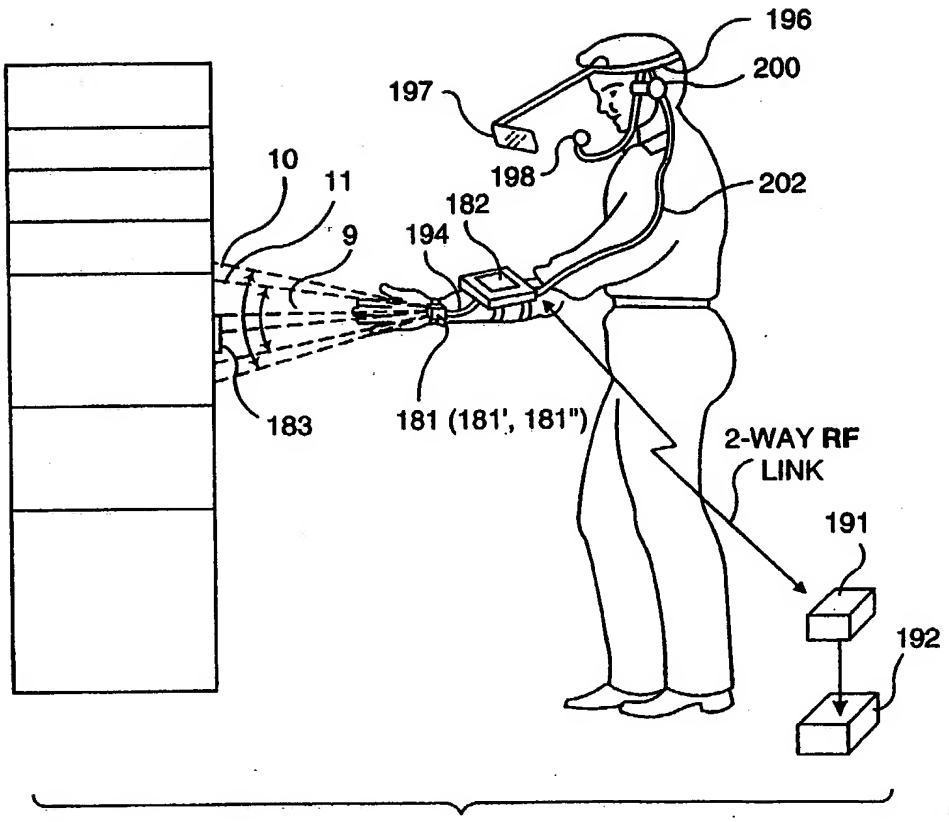

196
200
197
198
202
10
11
9
182
194
183
181 (181', 181")
2-WAY RF
LINK
191
192

FIG. 8D

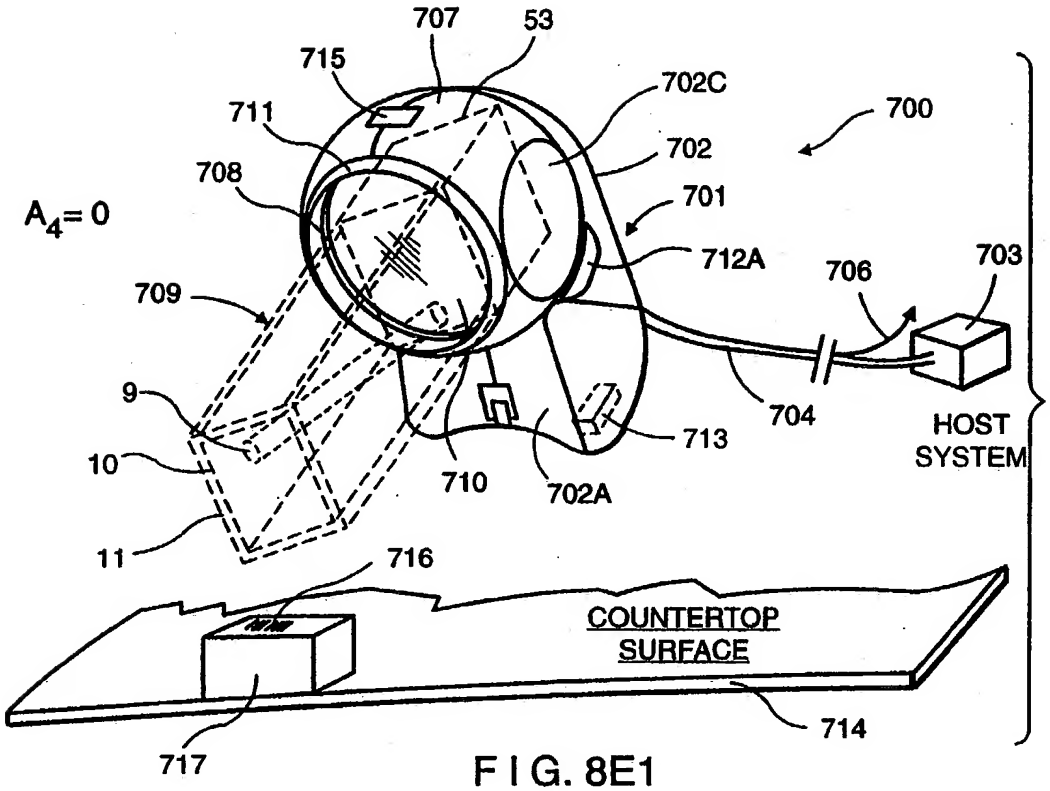


FIG. 8E1

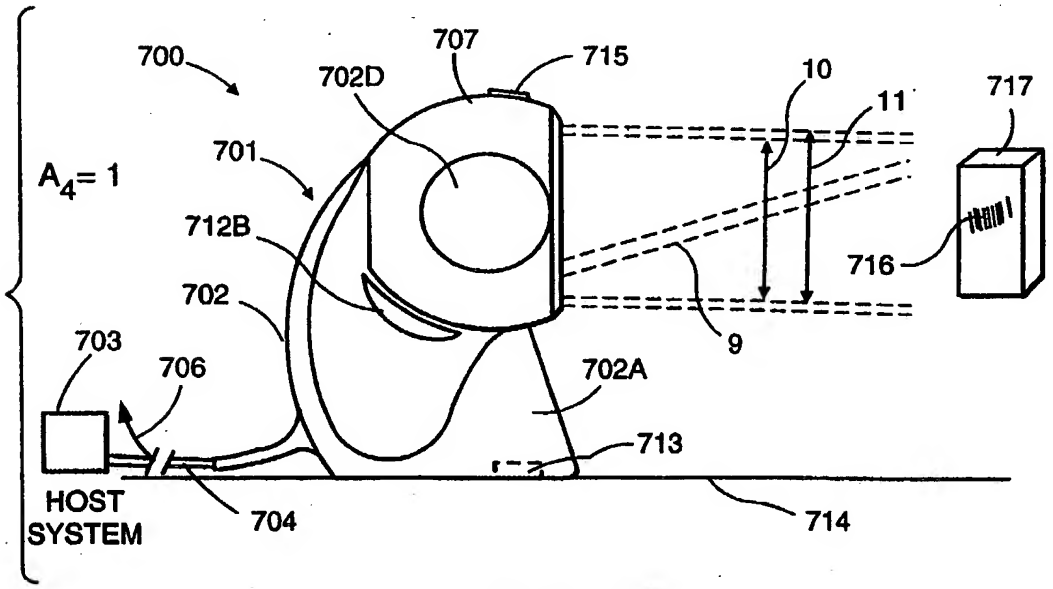


FIG. 8E2

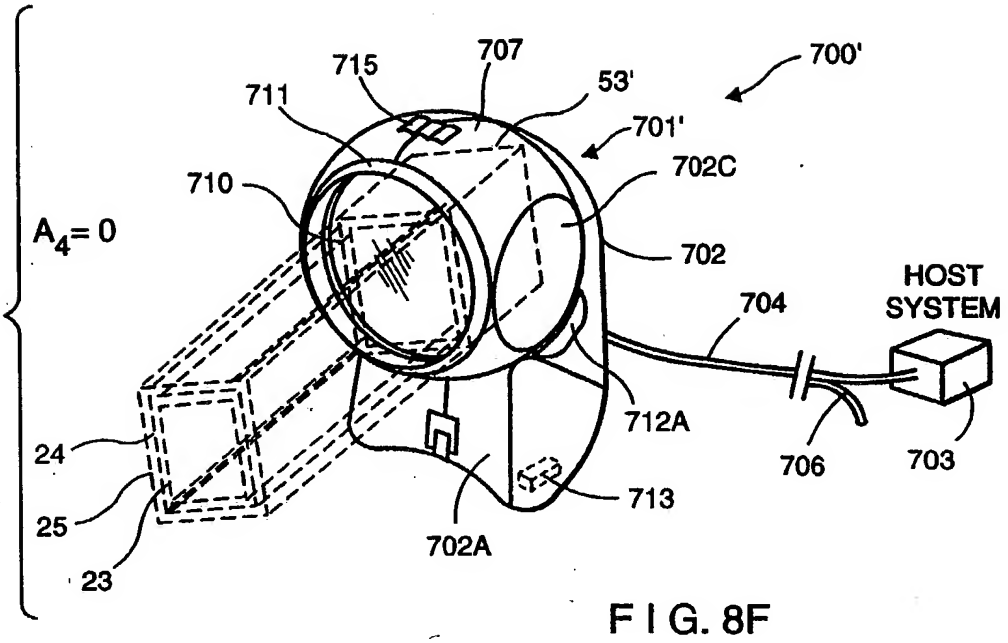

700'
715
707
711
53'
701'
710
702C
$A_4 = 0$
702
HOST
SYSTEM
704
712A
24
706
703
25
713
23
702A

FIG. 8F

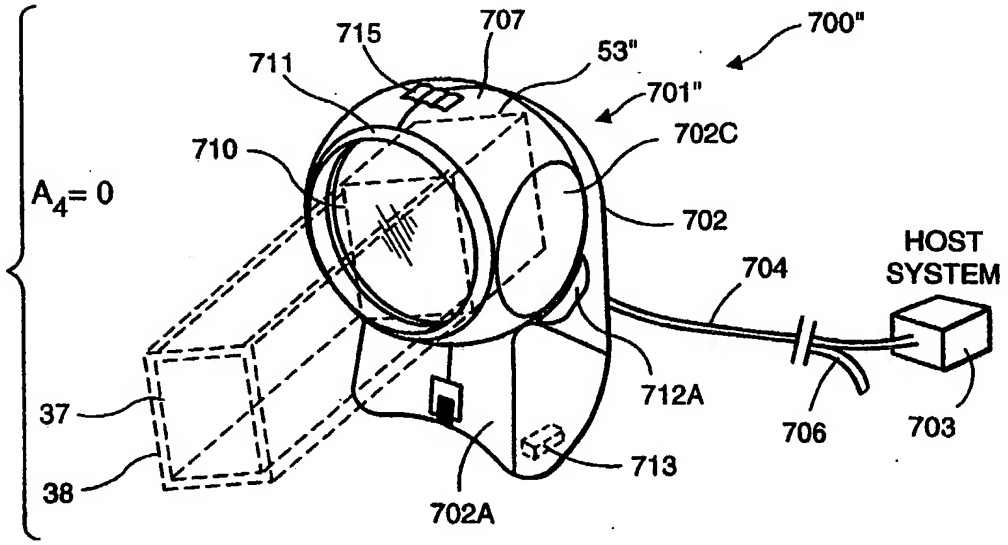

700"
715
707
711
53"
701"
710
702C
$A_4 = 0$
702
HOST
SYSTEM
704
712A
37
706
703
713
38
702A

FIG. 8G

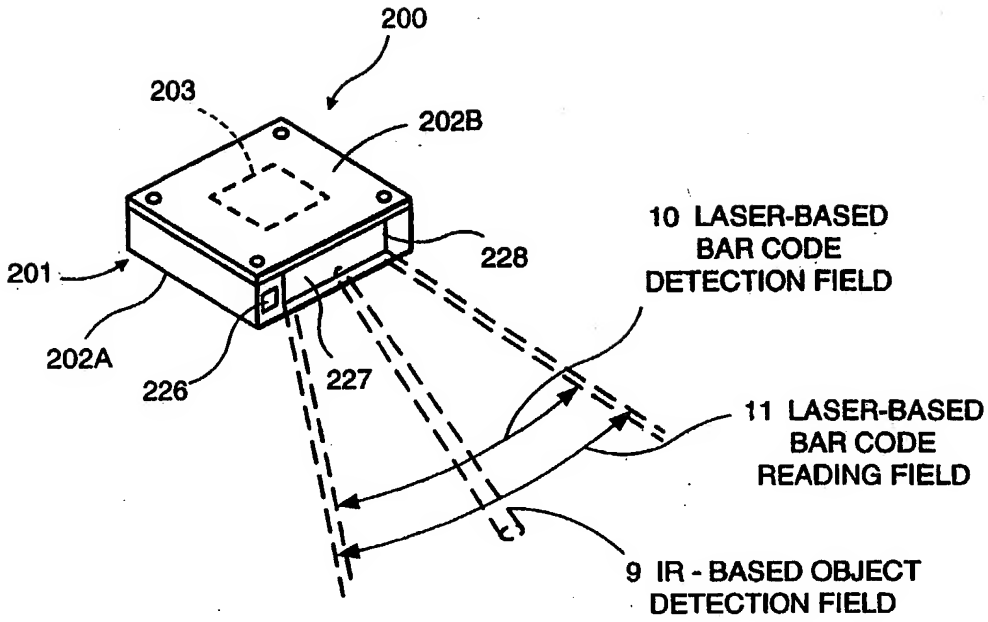

200
203
202B
228
10 LASER-BASED
BAR CODE
DETECTION FIELD
201
202A
226
227
11 LASER-BASED
BAR CODE
READING FIELD
9 IR - BASED OBJECT
DETECTION FIELD

FIG. 9A

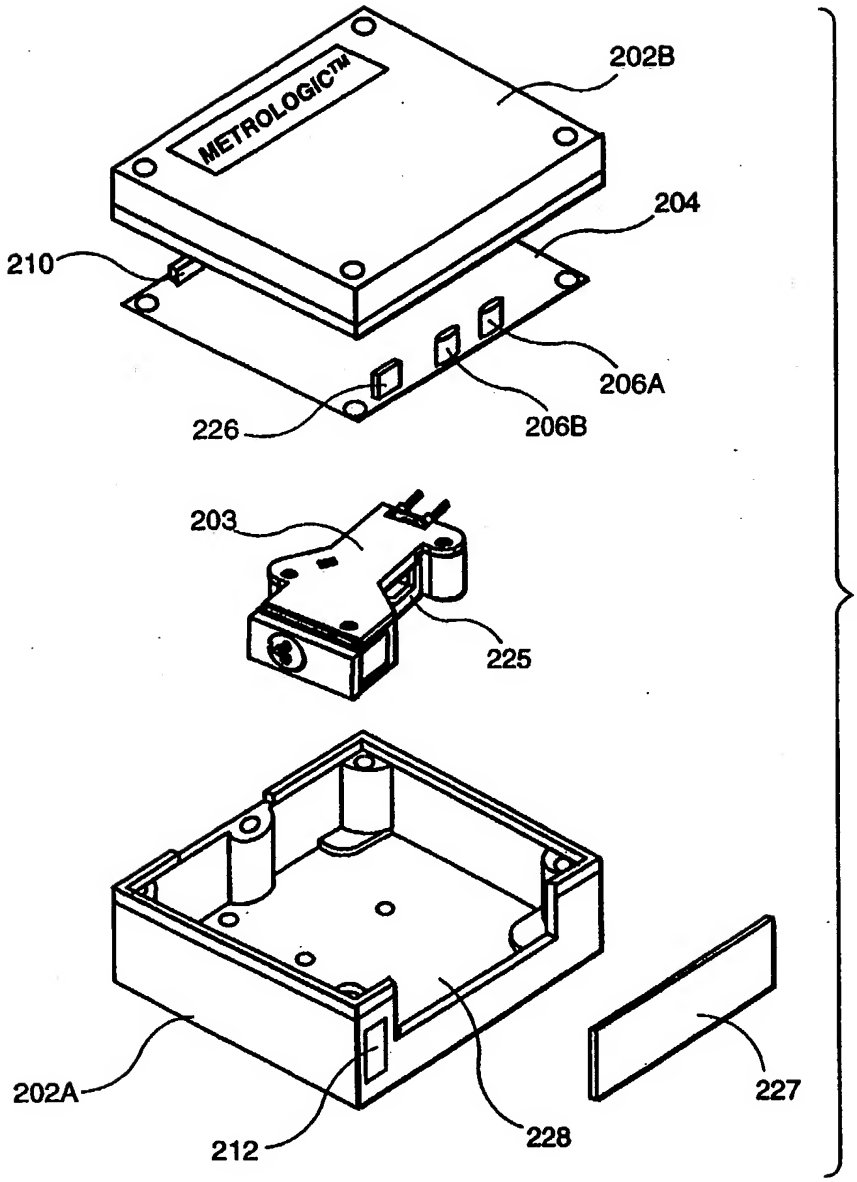

METROLOGIC™
202B
204
210
206A
206B
226
203
225
202A
212
228
227

FIG. 9B

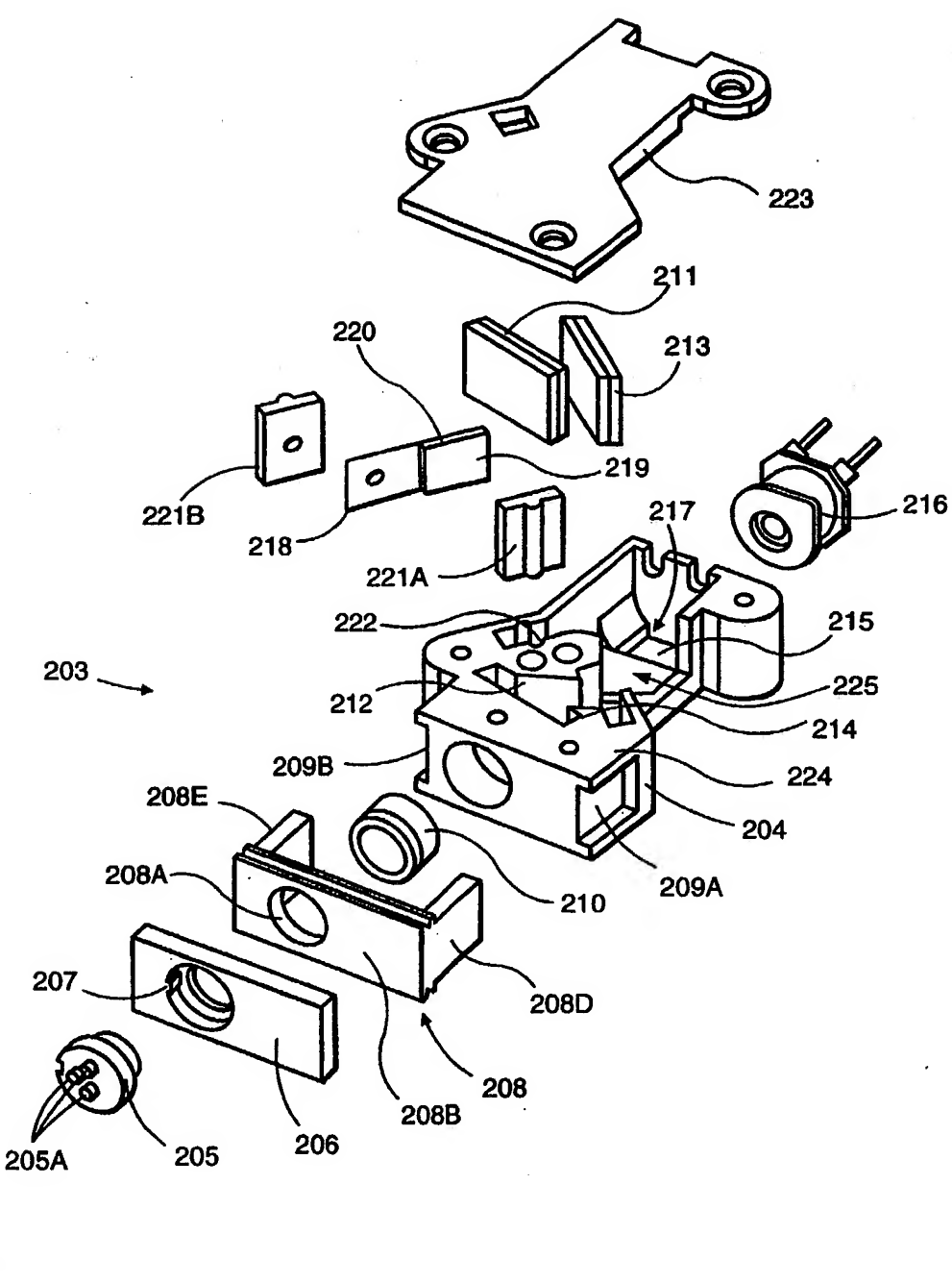

223
211
220
213
219
221B
218
221A
216
217
222
215
203
212
225
214
209B
224
208E
204
208A
210
209A
207
208D
208
208B
205A
205
206

FIG. 9C

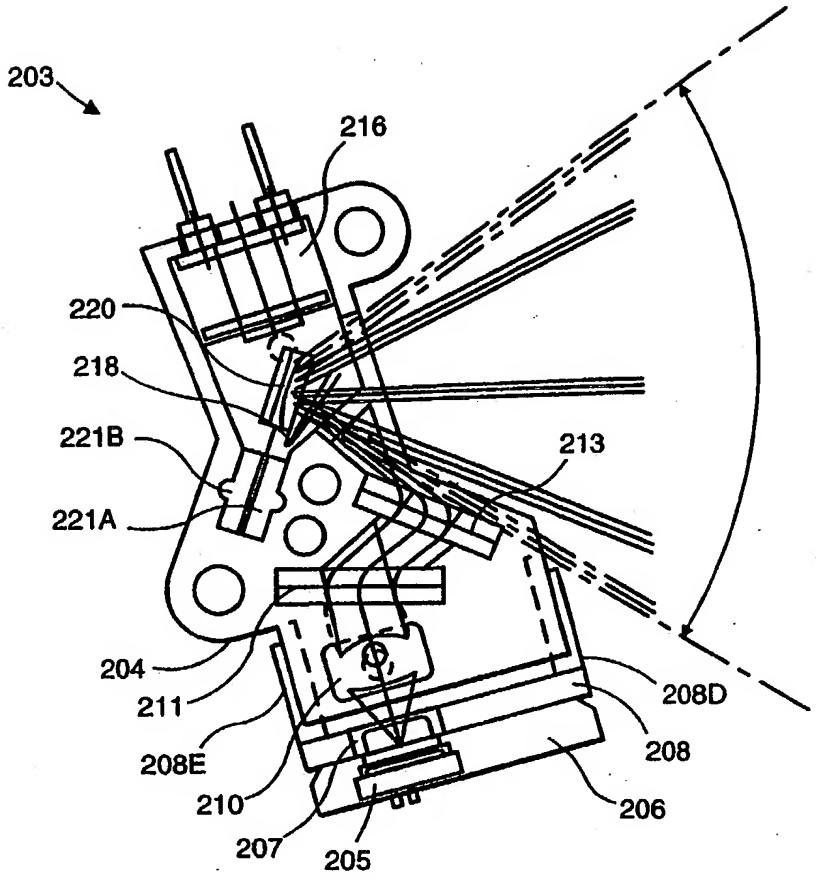

203
216
220
218
221B
221A
213
204
211
208E
210
207
205
208D
208
206

FIG. 9D

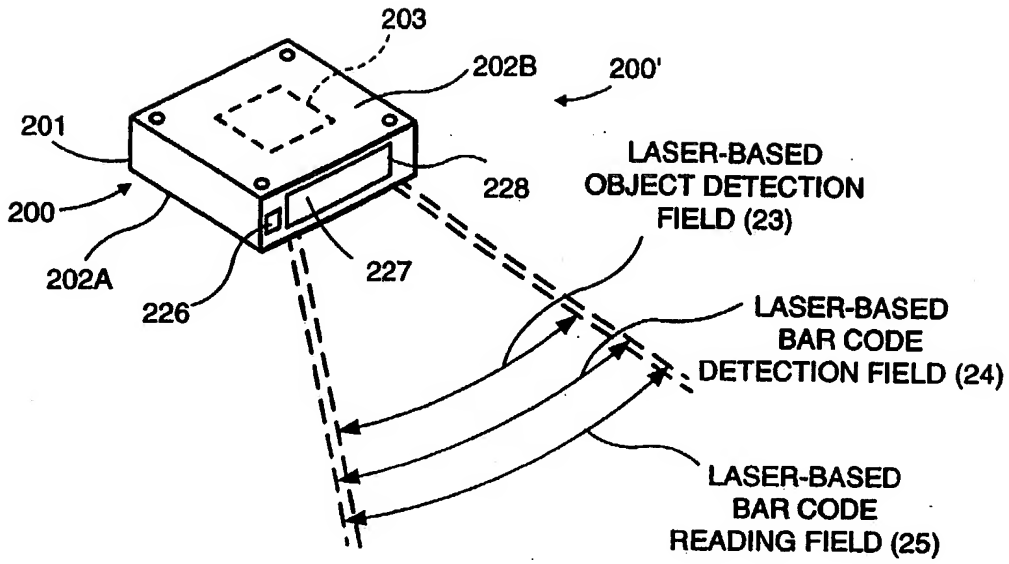

203
202B
200'
201
228
LASER-BASED
OBJECT DETECTION
FIELD (23)
200
202A
226
227
LASER-BASED
BAR CODE
DETECTION FIELD (24)
LASER-BASED
BAR CODE
READING FIELD (25)

FIG. 9E

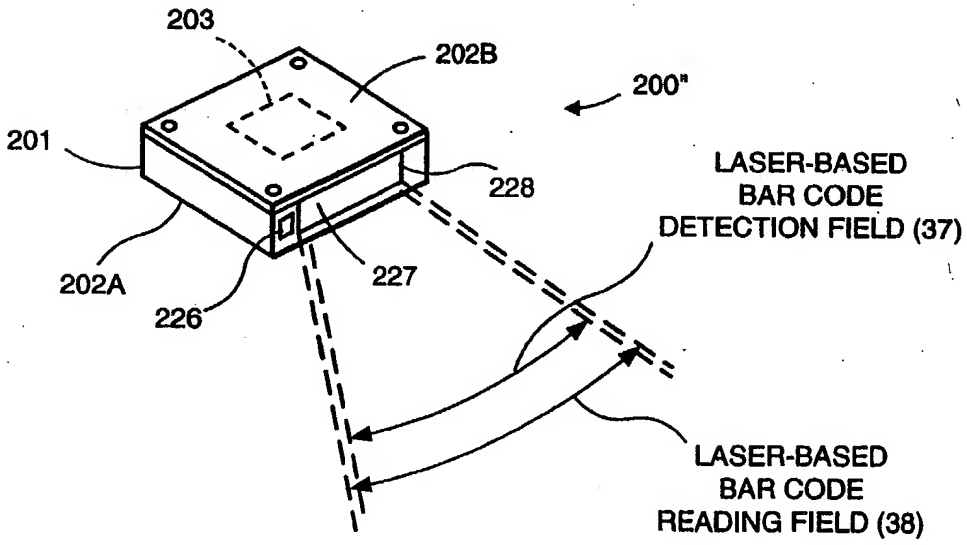
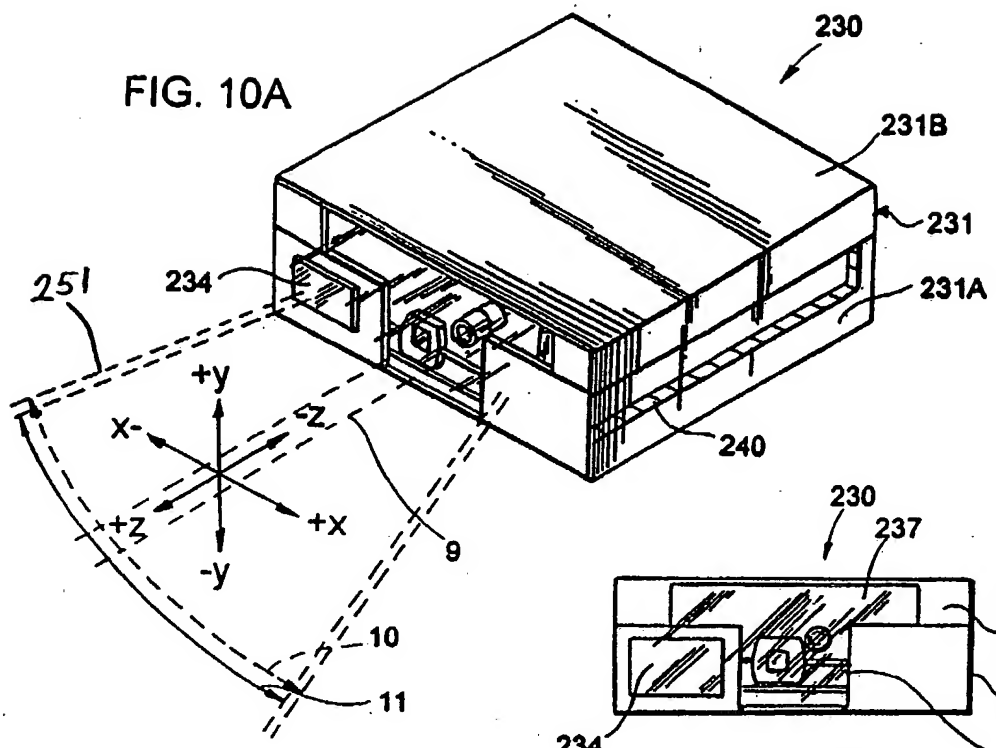

203
202B
200"
201
228
LASER-BASED
BAR CODE
DETECTION FIELD (37)
202A
227
226
LASER-BASED
BAR CODE
READING FIELD (38)

FIG. 9F

FIG. 10A



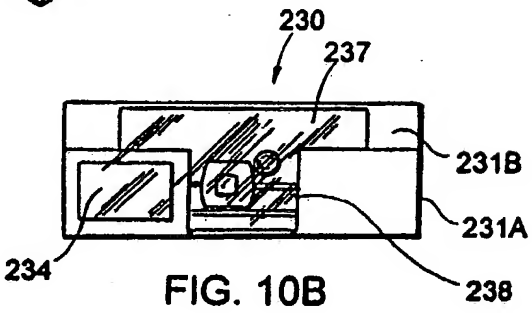


FIG. 10B

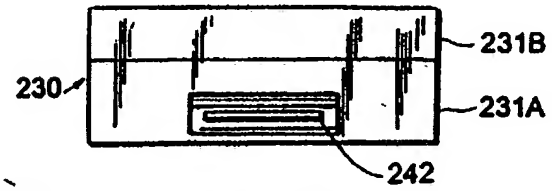


FIG. 10C

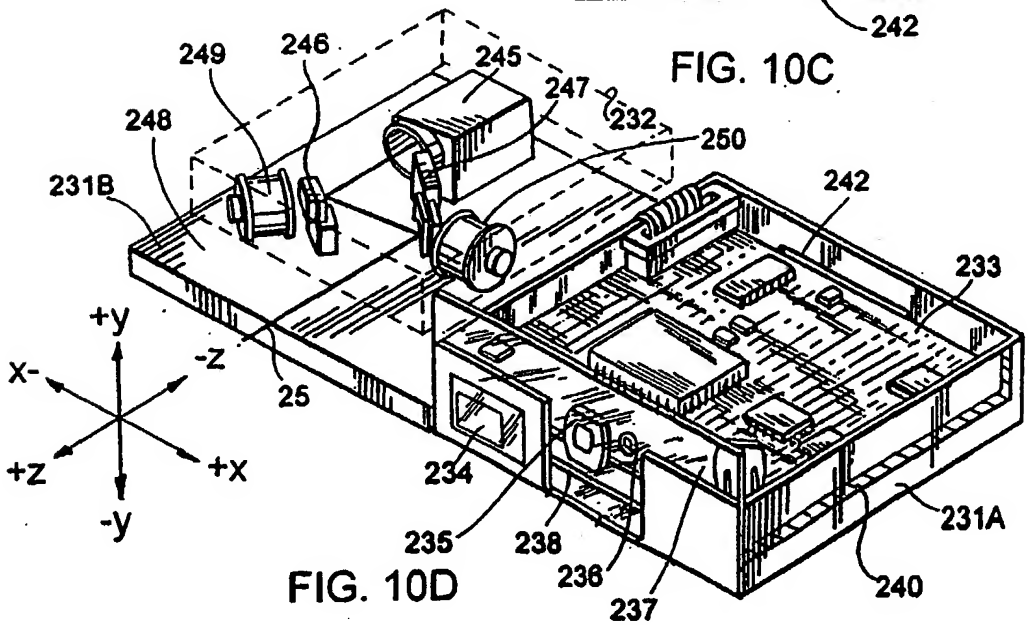


FIG. 10D

FIG. 10E

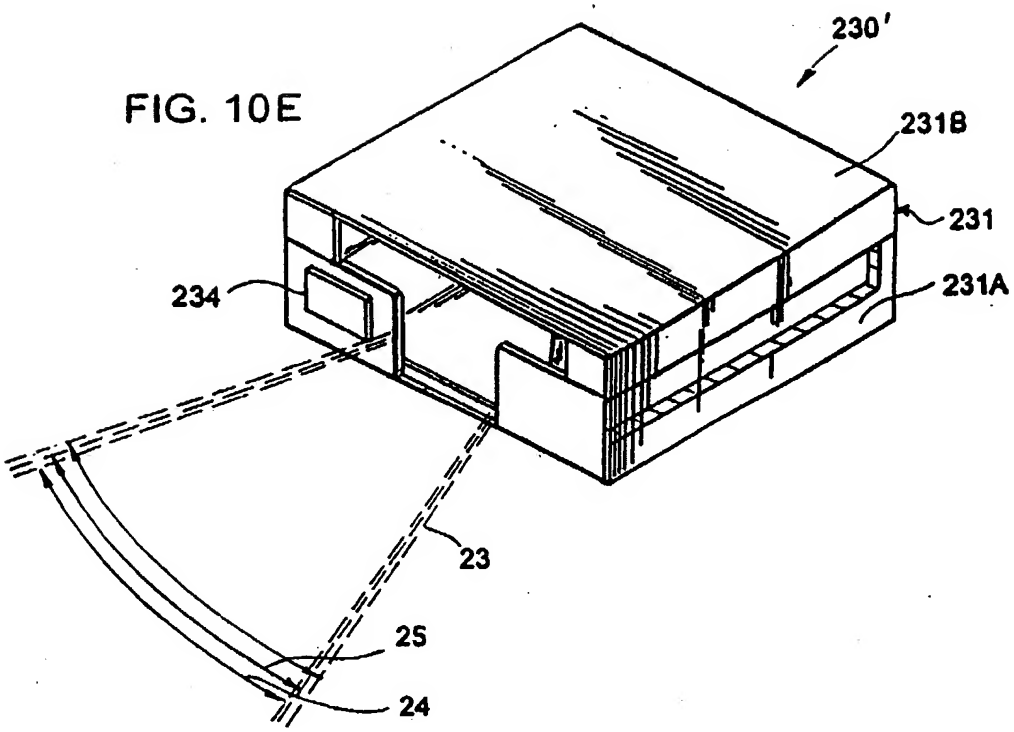
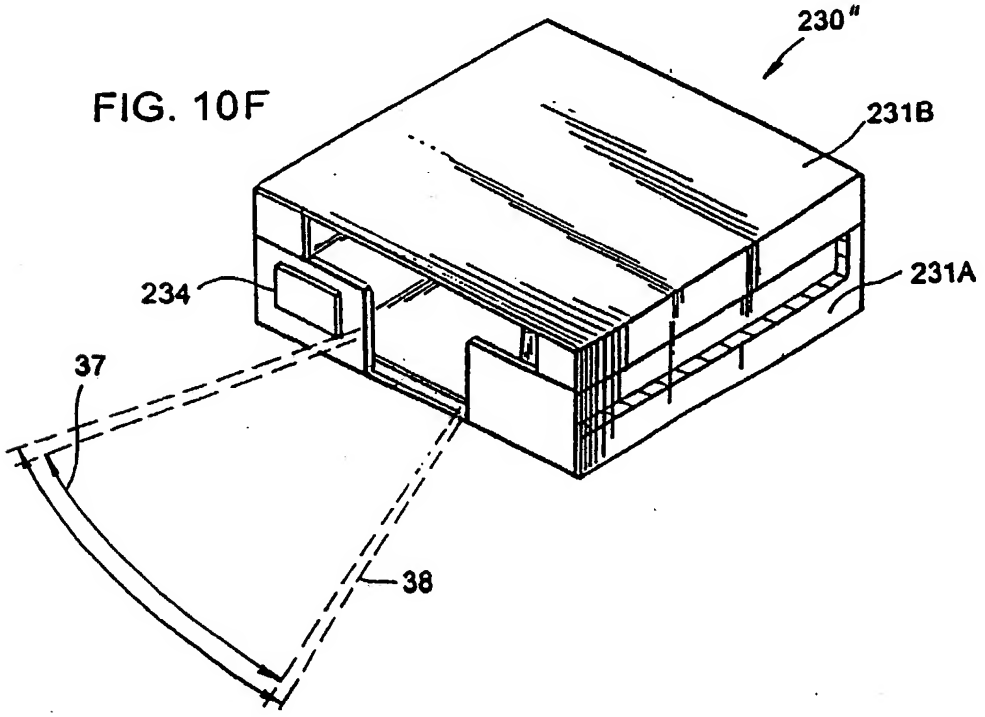


FIG. 10F



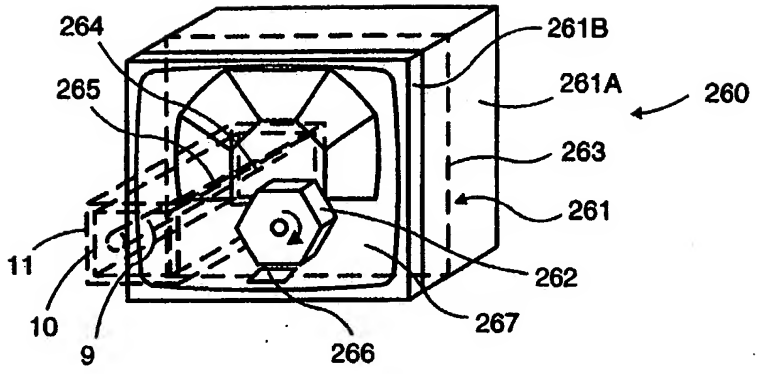


FIG. 11A

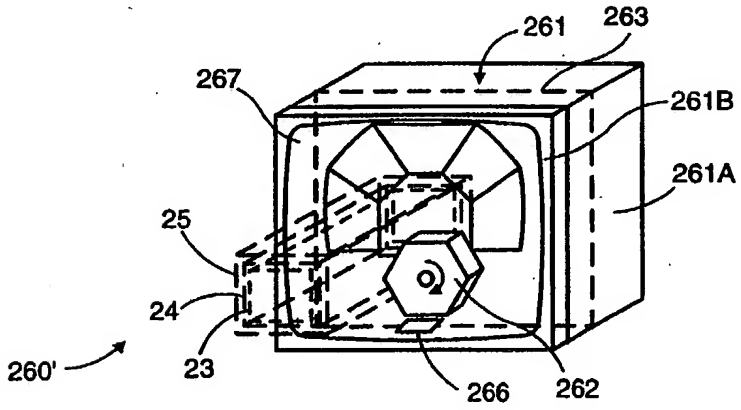


FIG. 11B

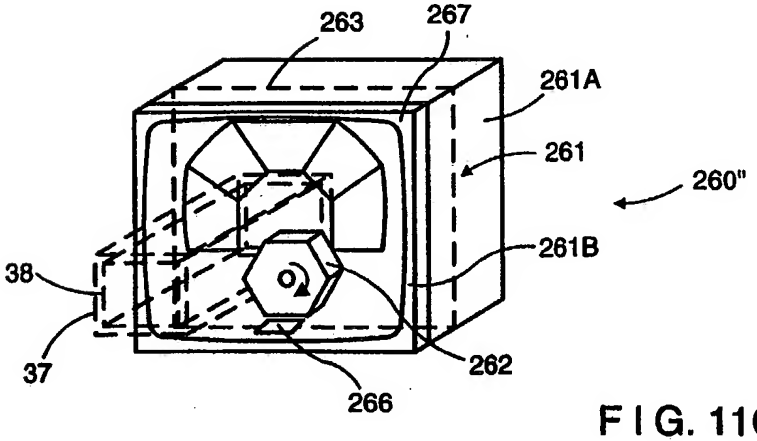


FIG. 11C

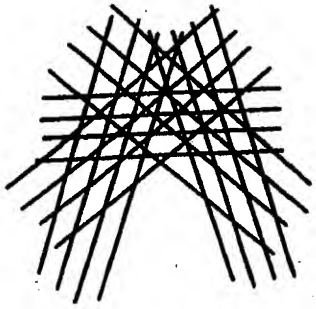


FIG. 12A

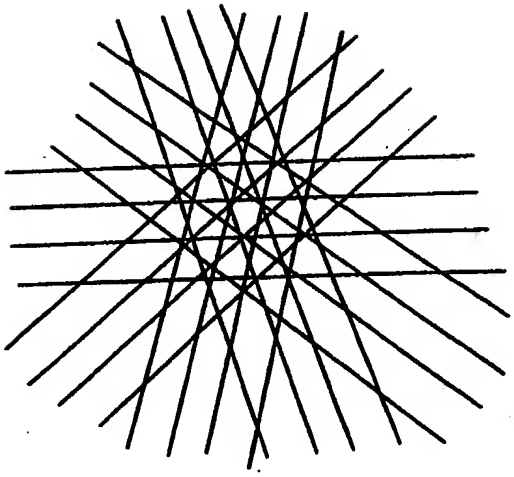


FIG. 12B

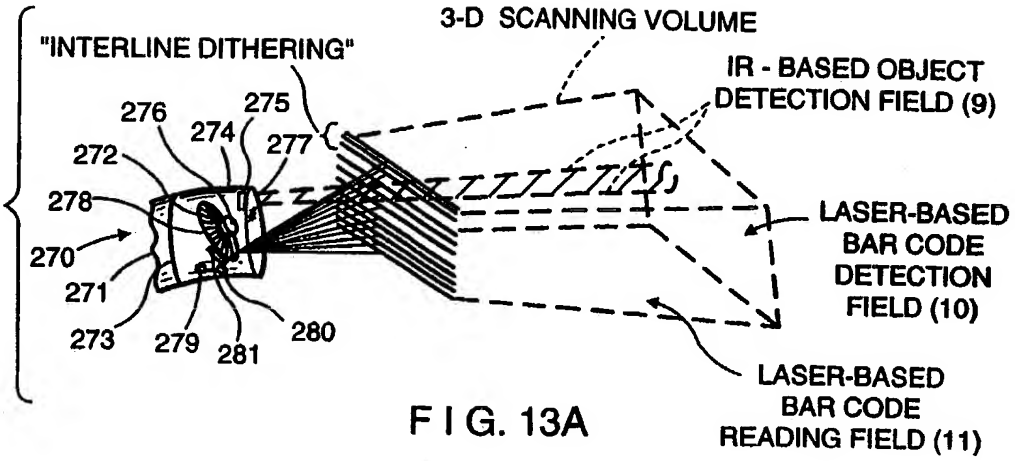


FIG. 13A

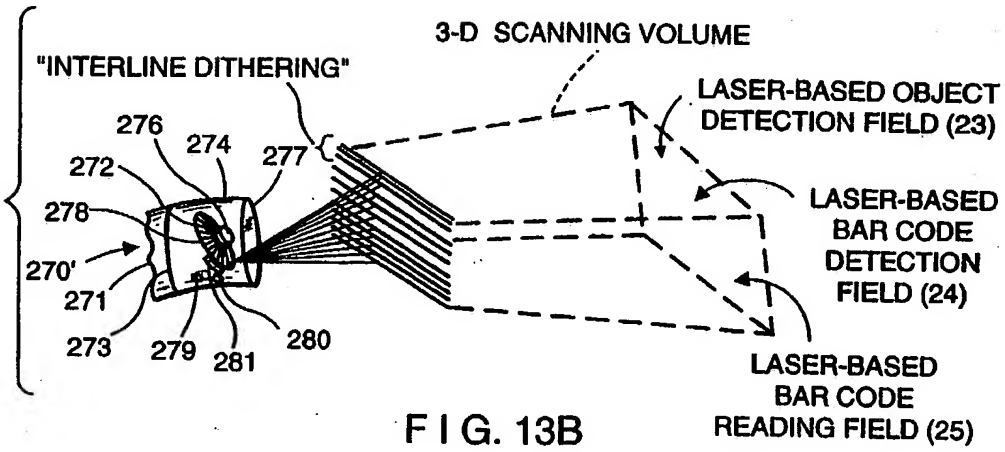


FIG. 13B

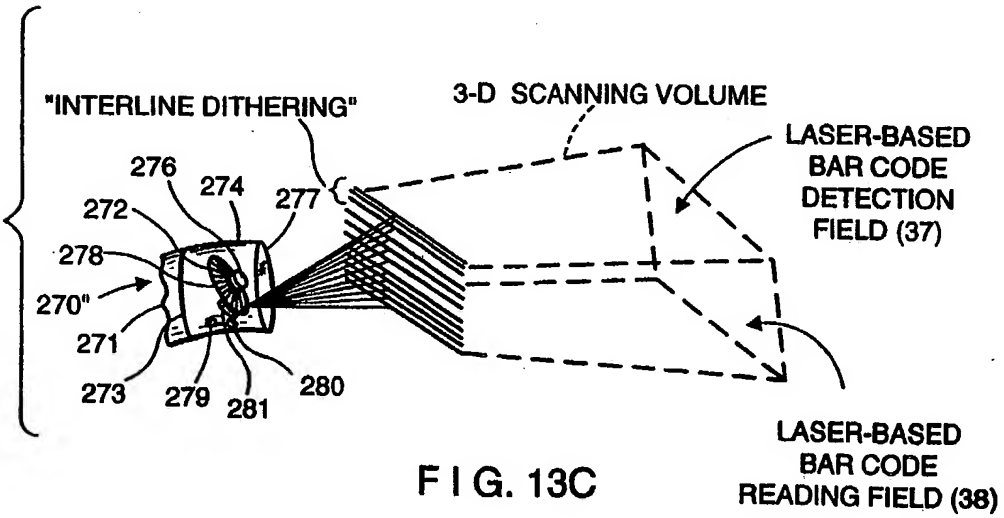


FIG. 13C

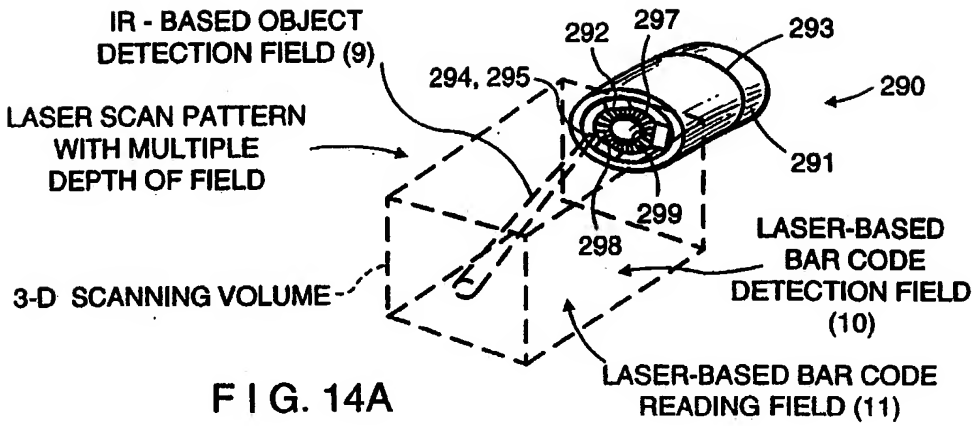


FIG. 14A

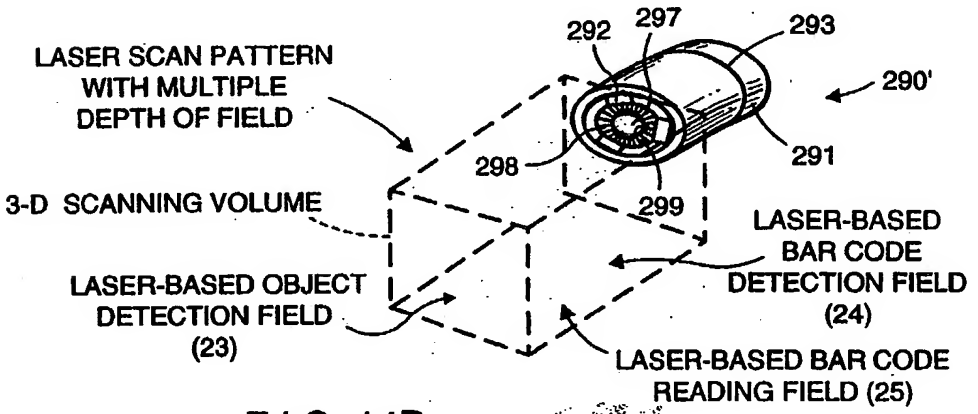


FIG. 14B

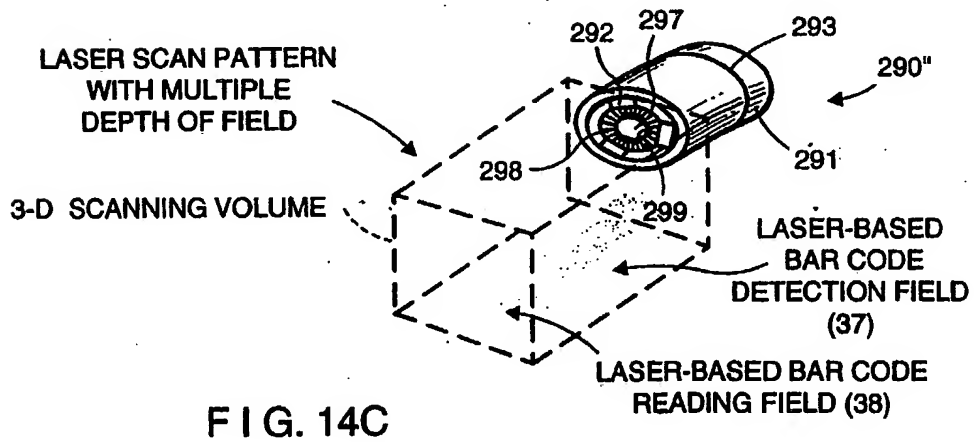


FIG. 14C

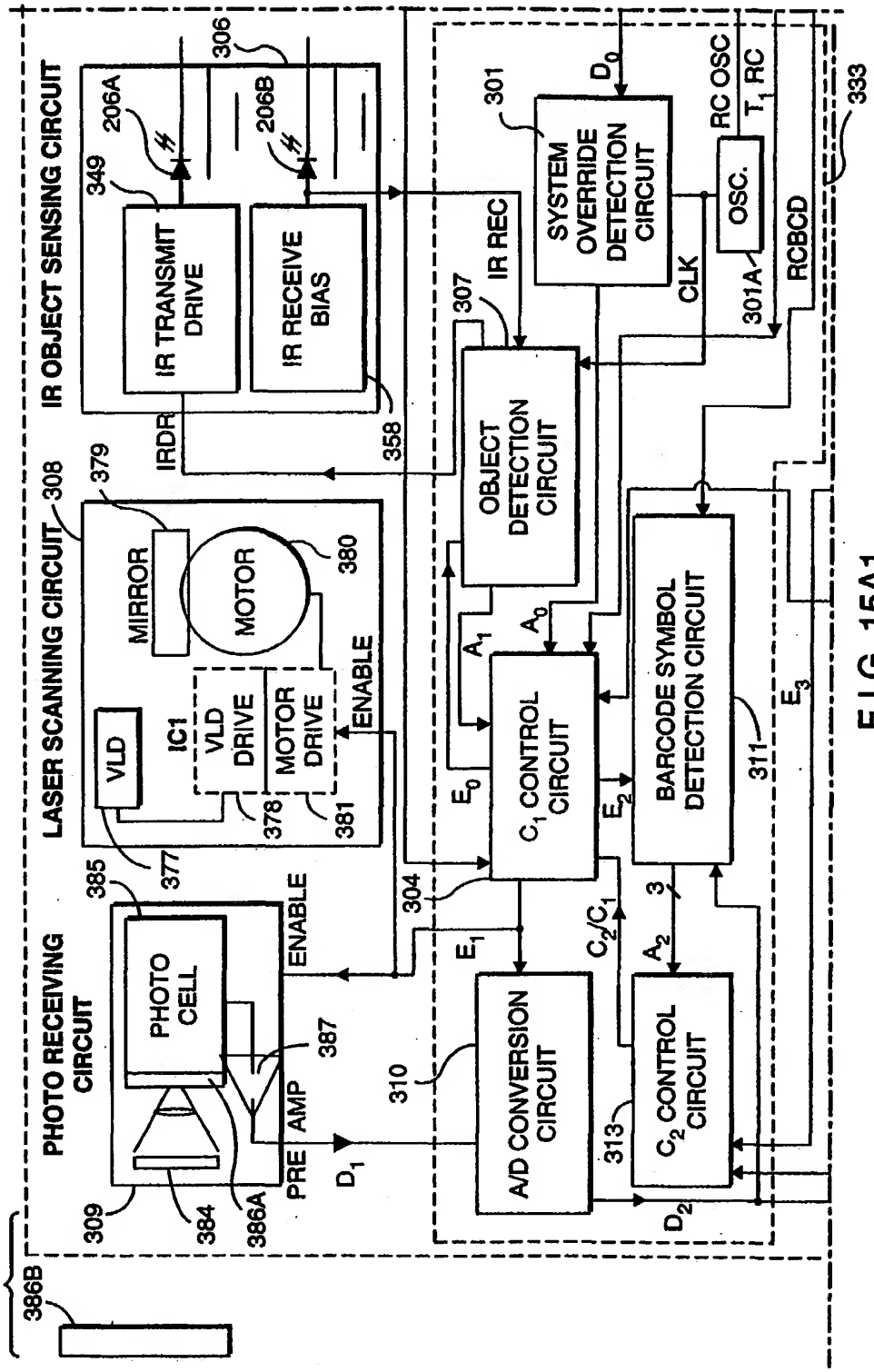


PHOTO RECEIVING CIRCUIT
LASER SCANNING CIRCUIT
IR OBJECT SENSING CIRCUIT
PHOTO CELL
PRE AMP
ENABLE
VLD
IC1
VLD DRIVE
MOTOR DRIVE
ENABLE
MIRROR
MOTOR
IR TRANSMIT DRIVE
IR RECEIVE BIAS
IRDR
IR REC
OBJECT DETECTION CIRCUIT
SYSTEM OVERRIDE DETECTION CIRCUIT
OSC.
RC OSC
CLK
RCBCD
C_1 CONTROL CIRCUIT
BARCODE SYMBOL DETECTION CIRCUIT
A/D CONVERSION CIRCUIT
C_2 CONTROL CIRCUIT
D_0
D_1
D_2
T_1 RC
A_0
A_1
A_2
E_0
E_1
E_2
E_3
C_2/C_1
3
309
310
311
313
333
358
377
378
379
380
381
384
385
386A
386B
387
301
301A
304
306
307
308
206A
206B
349

FIG. 15A1

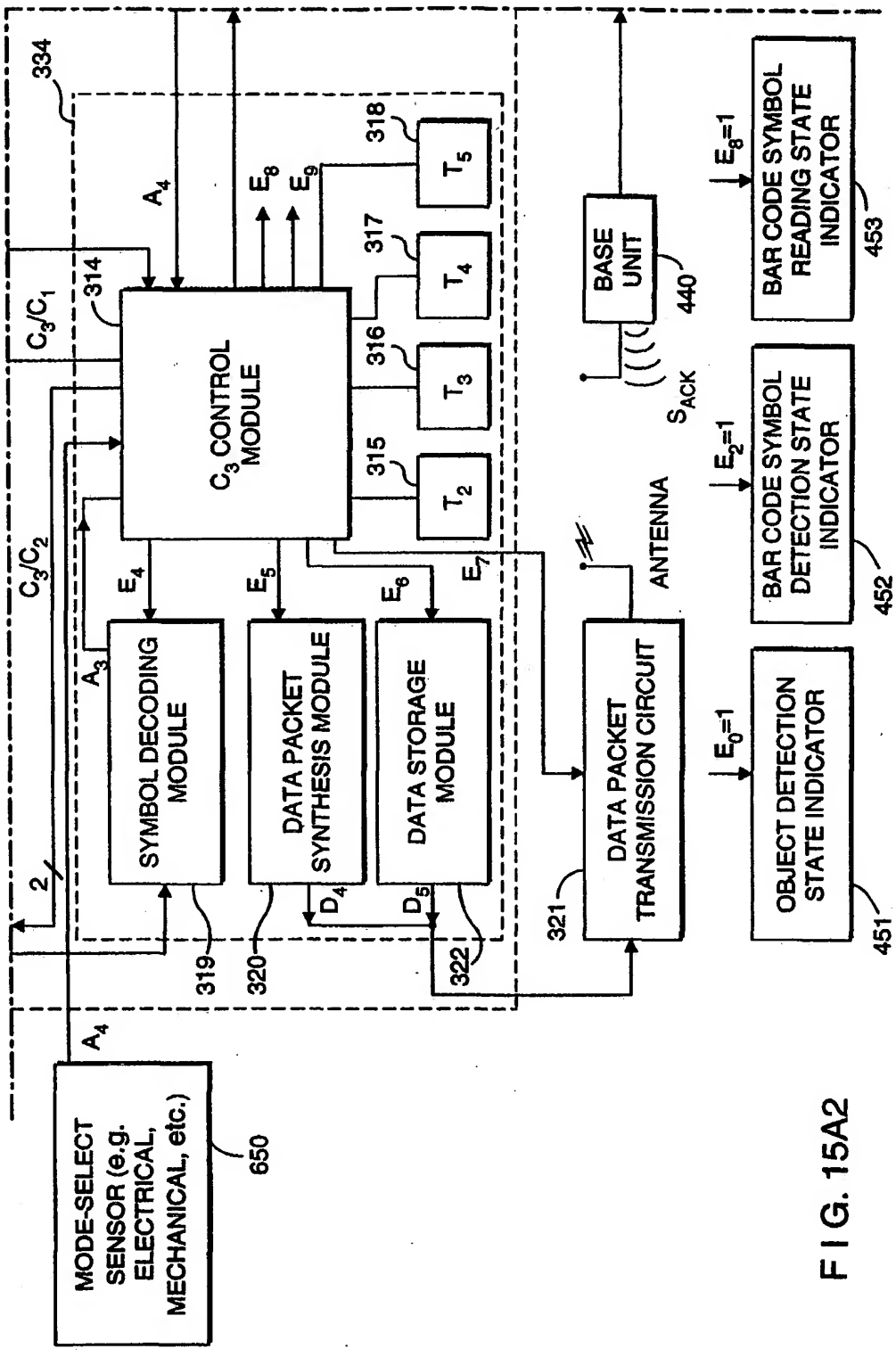

MODE-SELECT SENSOR (e.g. ELECTRICAL, MECHANICAL, etc.)
650
A4
C3/C1
C3/C2
2
334
314
C3 CONTROL MODULE
A4
E8
E9
318
T5
317
T4
316
T3
315
T2
E4
E5
E6
E7
A3
SYMBOL DECODING MODULE
DATA PACKET SYNTHESIS MODULE
DATA STORAGE MODULE
D4
D5
319
320
322
321
DATA PACKET TRANSMISSION CIRCUIT
ANTENNA
SACK
BASE UNIT
440
E0=1
OBJECT DETECTION STATE INDICATOR
451
E2=1
BAR CODE SYMBOL DETECTION STATE INDICATOR
452
E8=1
BAR CODE SYMBOL READING STATE INDICATOR
453

FIG. 15A2

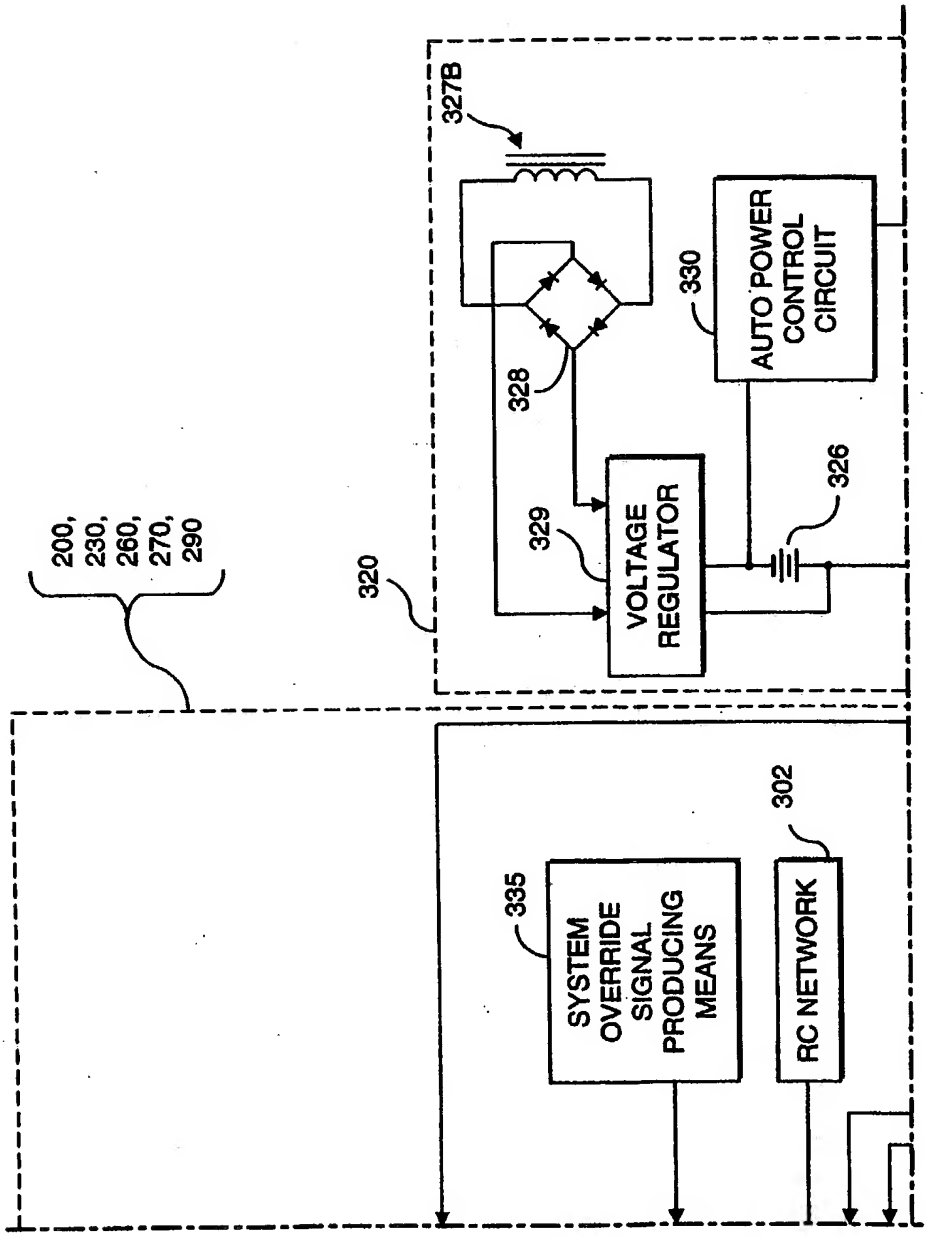

200,
230,
260,
270,
290
320
327B
328
329
VOLTAGE REGULATOR
326
330
AUTO POWER CONTROL CIRCUIT
335
SYSTEM OVERRIDE SIGNAL PRODUCING MEANS
302
RC NETWORK

FIG. 15A3

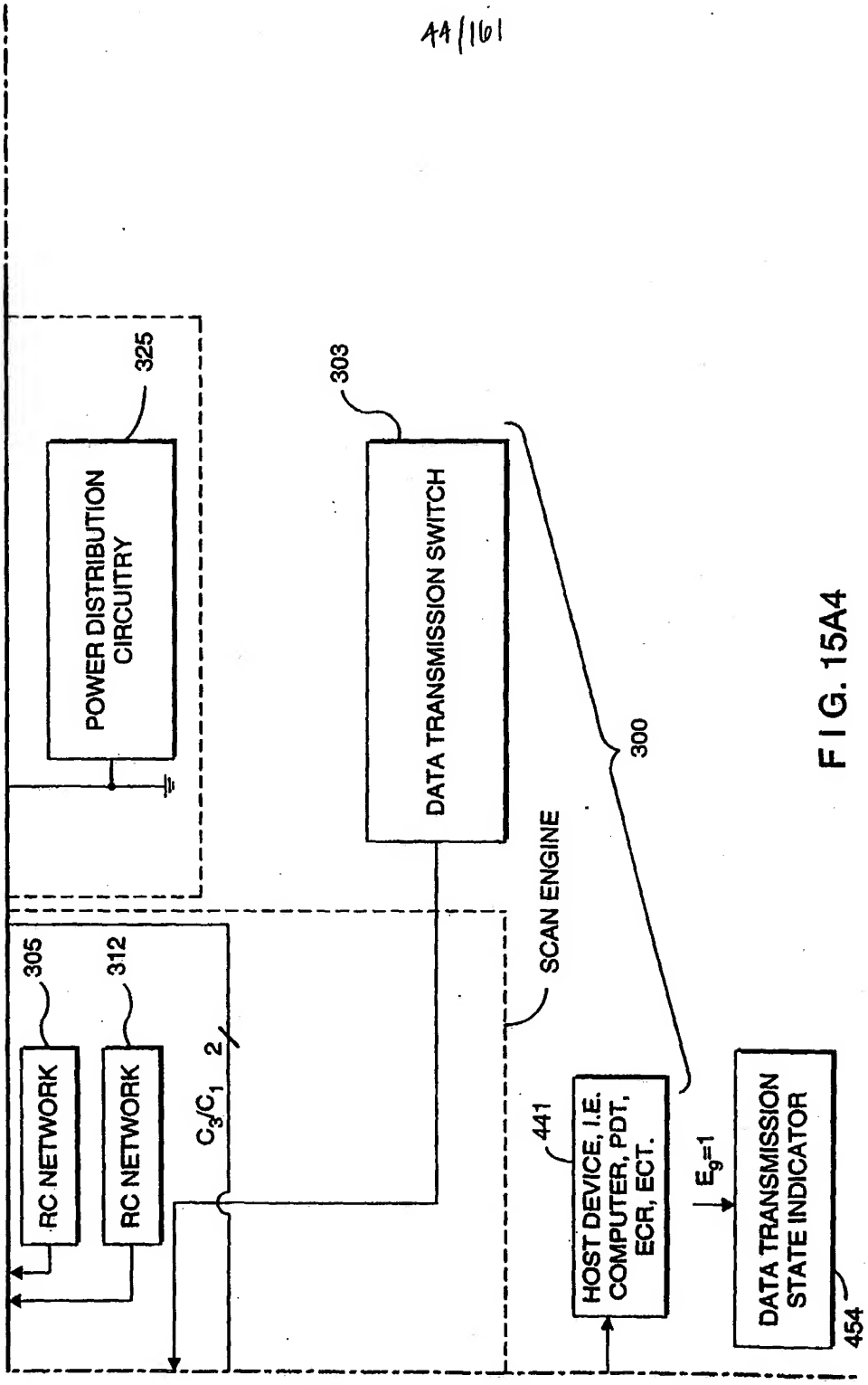

POWER DISTRIBUTION CIRCUITRY
325
303
DATA TRANSMISSION SWITCH
300
SCAN ENGINE
305
RC NETWORK
312
RC NETWORK
C_3/C_1 2
441
HOST DEVICE, I.E. COMPUTER, PDT, ECR, ECT.
E_g=1
DATA TRANSMISSION STATE INDICATOR
454

FIG. 15A4

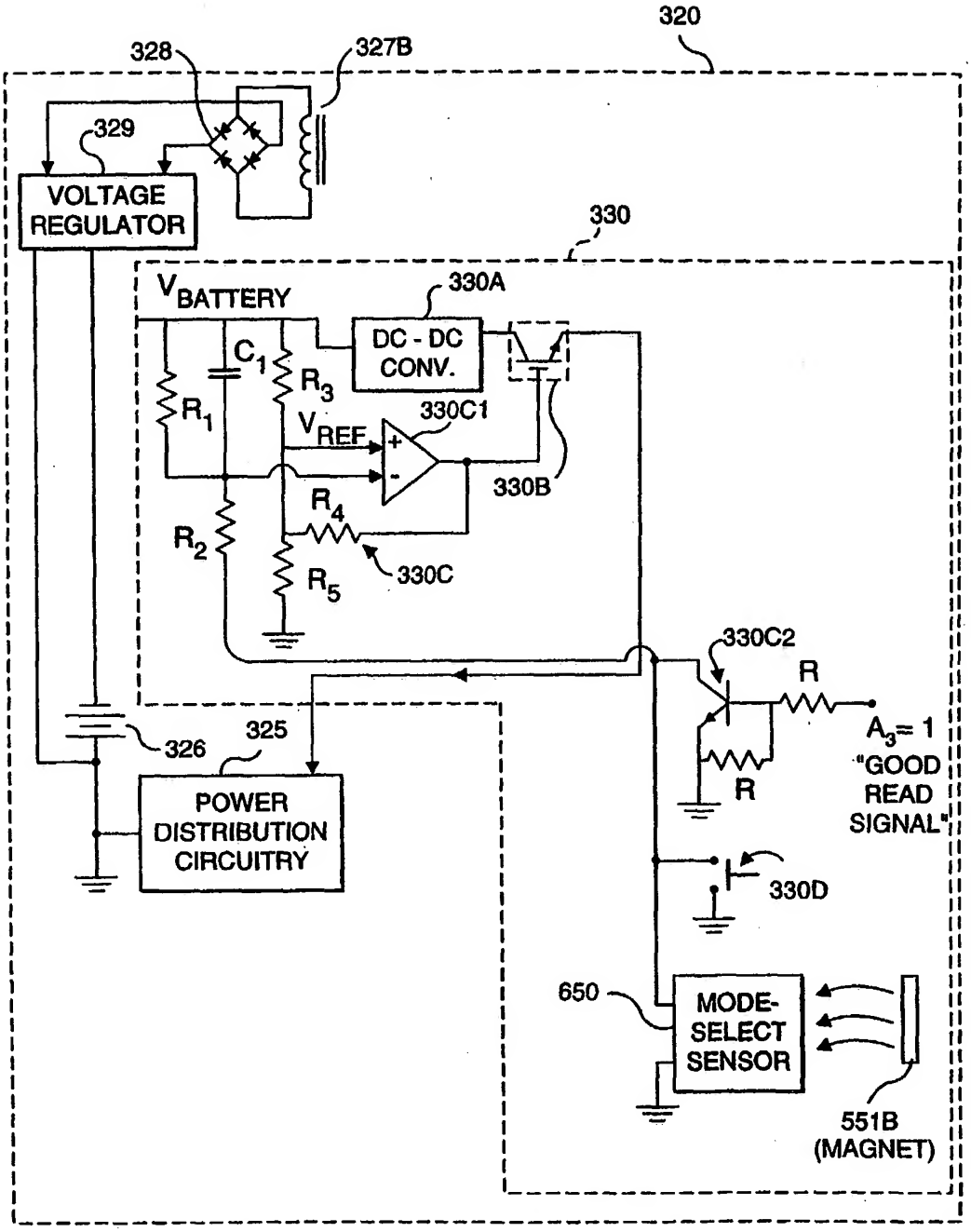

320
328
327B
329
VOLTAGE REGULATOR
330
$V_{BATTERY}$
330A
DC - DC CONV.
C_1
R_3
R_1
V_{REF}
330C1
330B
R_4
R_2
R_5
330C
330C2
R
A_3= 1 "GOOD READ SIGNAL"
R
326
325
POWER DISTRIBUTION CIRCUITRY
330D
650
MODE-SELECT SENSOR
551B (MAGNET)

FIG. 15B1

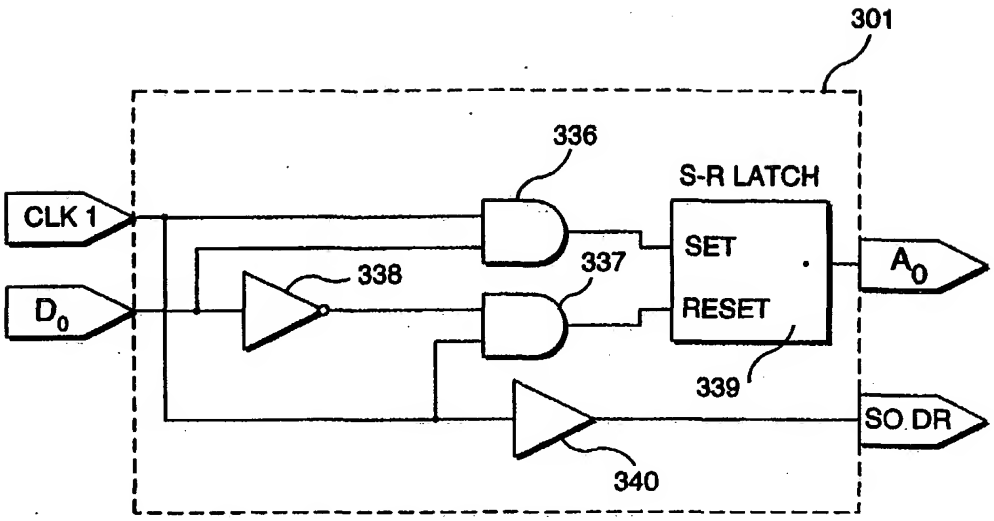


FIG. 15B2

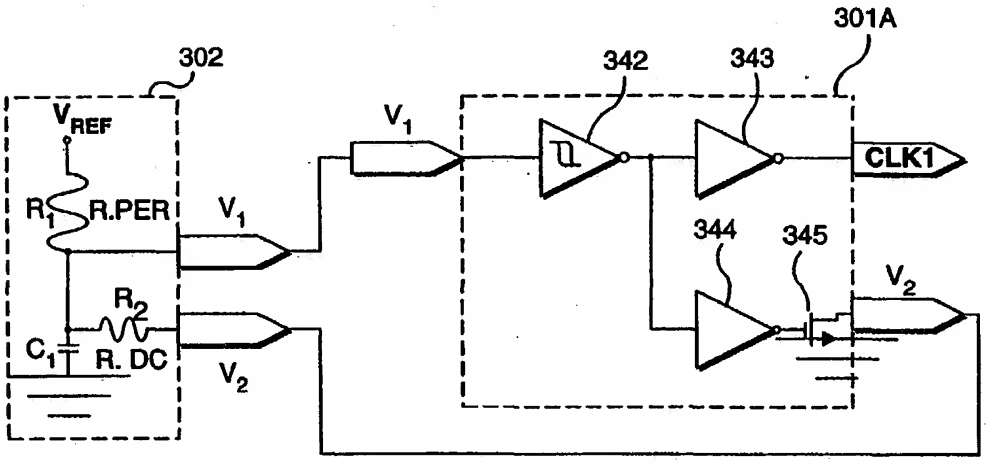


FIG. 15C

47/1161

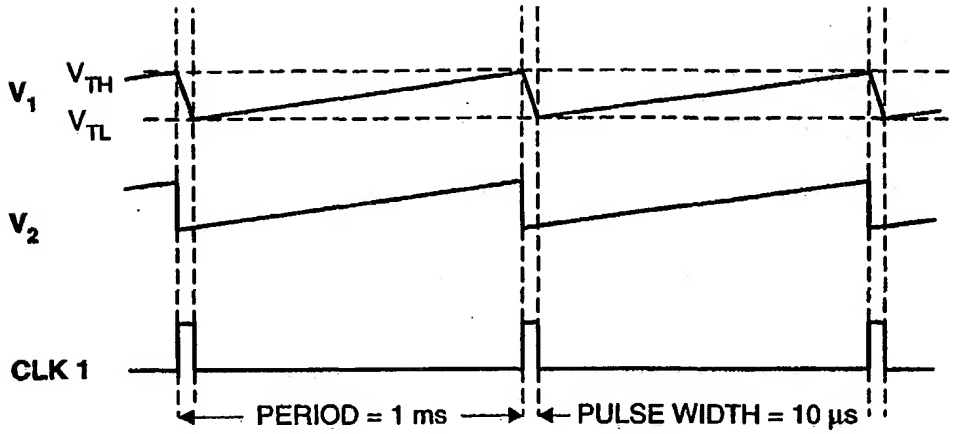


FIG. 15D

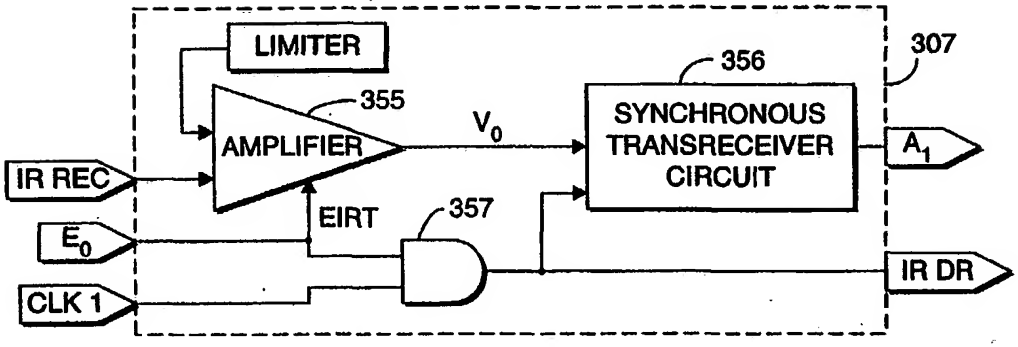


FIG. 15E

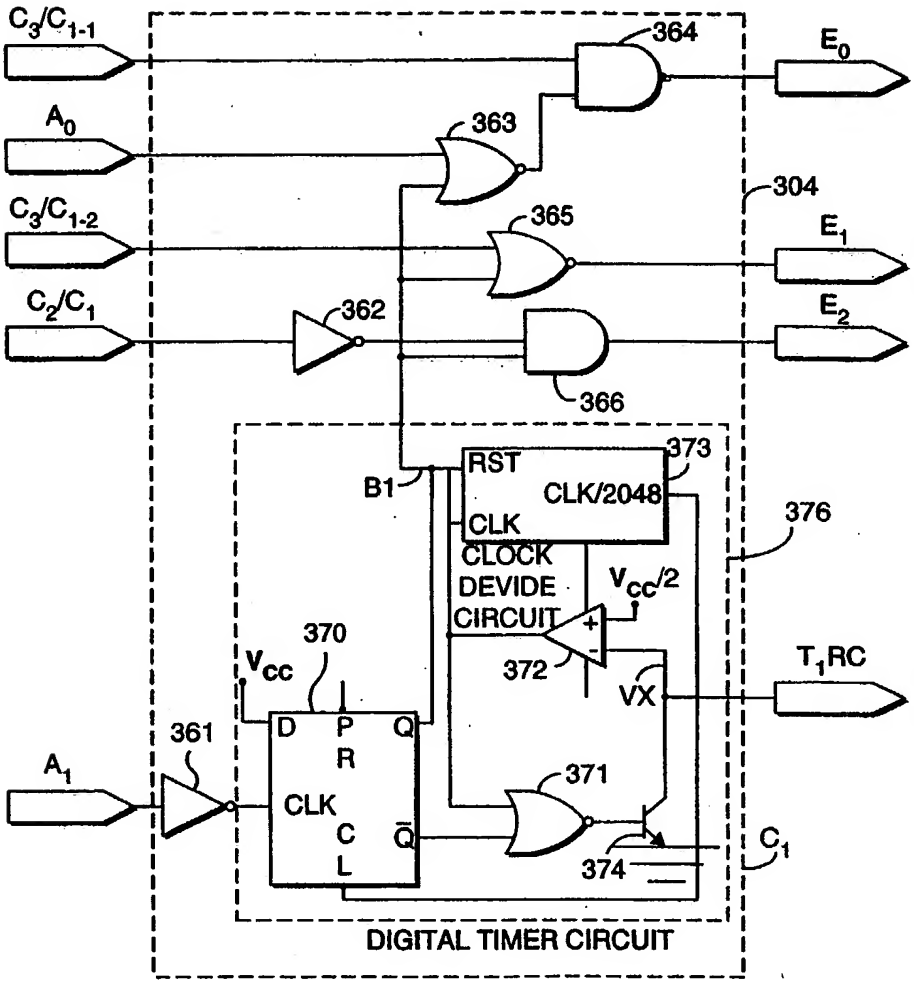

C3/C1-1
A0
C3/C1-2
C2/C1
A1
364
363
365
362
366
304
E0
E1
E2
373
RST
CLK/2048
CLK
CLOCK
DEVIDE
CIRCUIT
B1
376
Vcc/2
372
VX
T1RC
370
Vcc
361
D
P
R
Q
CLK
C
L
Q
371
374
C1
DIGITAL TIMER CIRCUIT

FIG. 15F

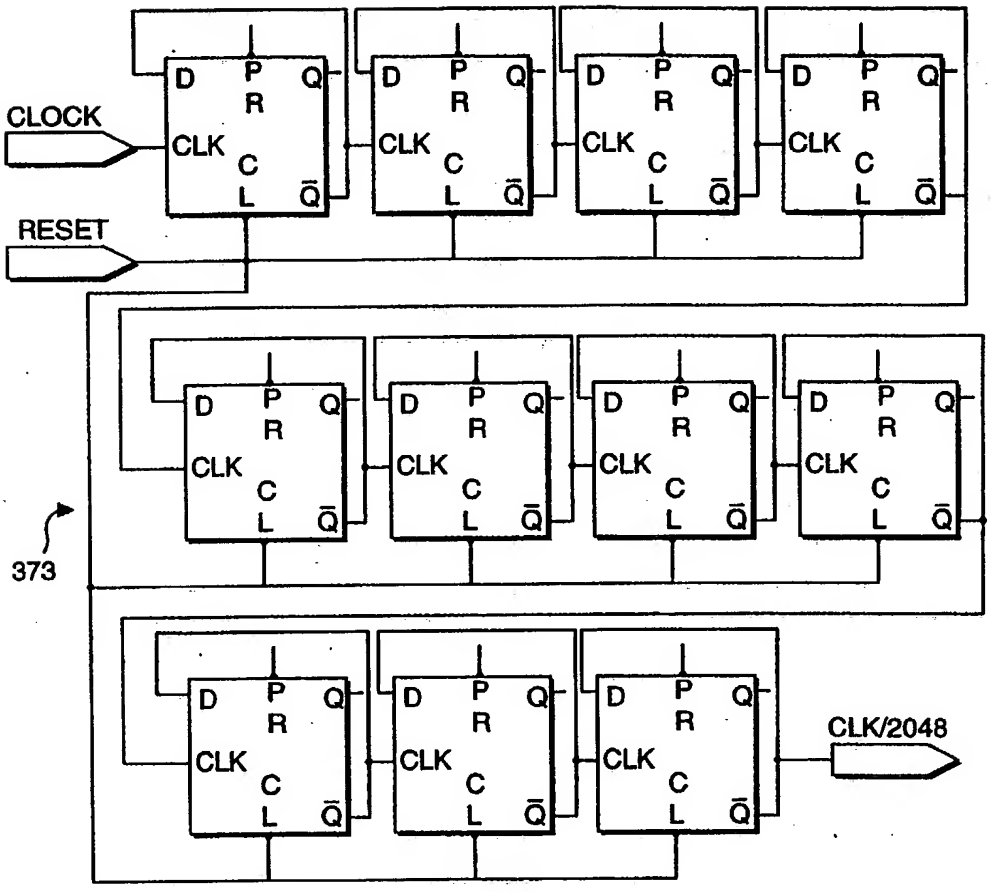


FIG. 15G

$$E_0 = \overline{(B1 + A_0)(C_3 / C_{1-1})}$$

$$E_1 = (C_3 / C_{1-2}) + B1$$

$$E_2 = (C_2 / C_1)(T_1)$$

FIG. 15H

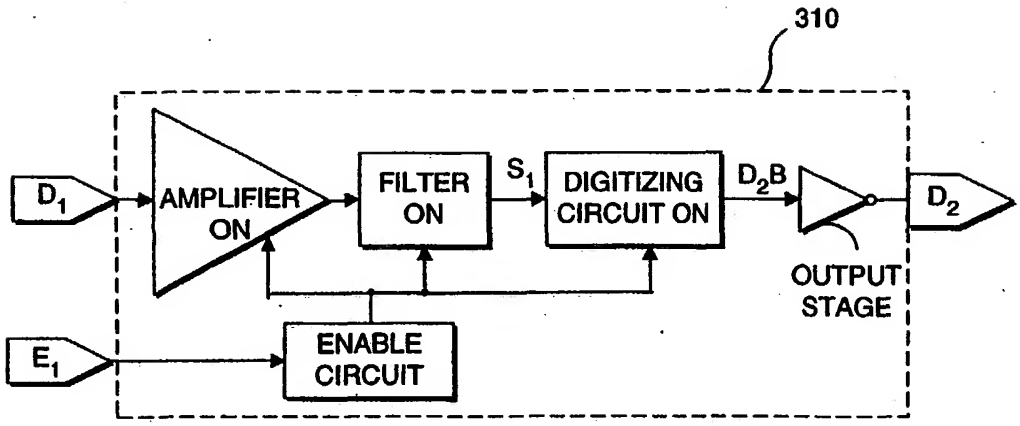


FIG. 15I

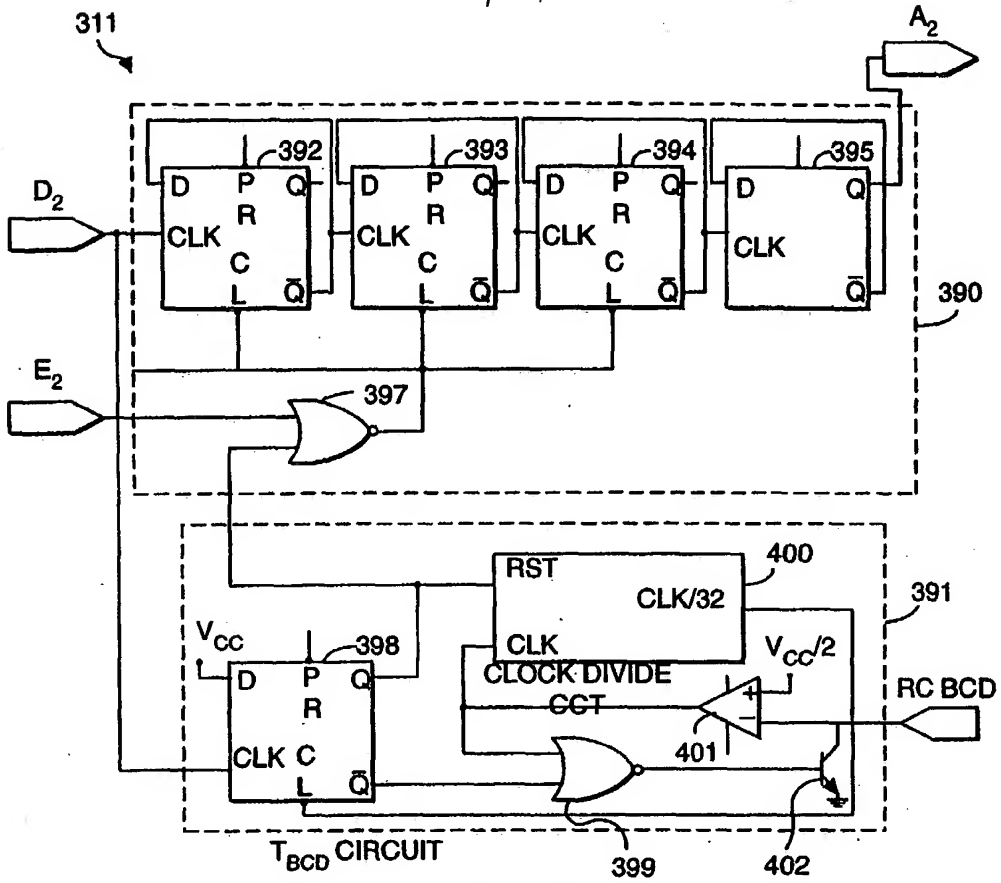


FIG. 15J

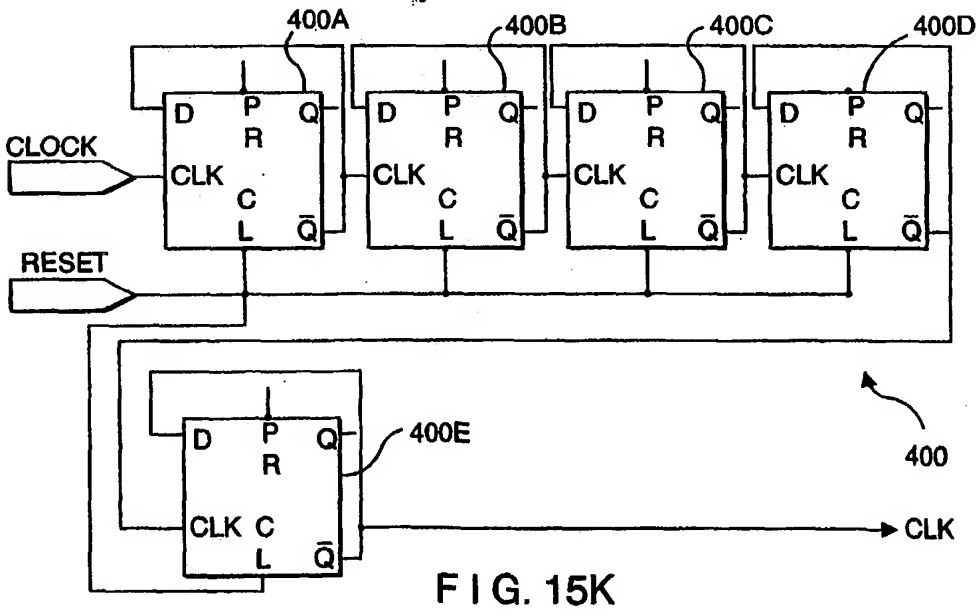


FIG. 15K

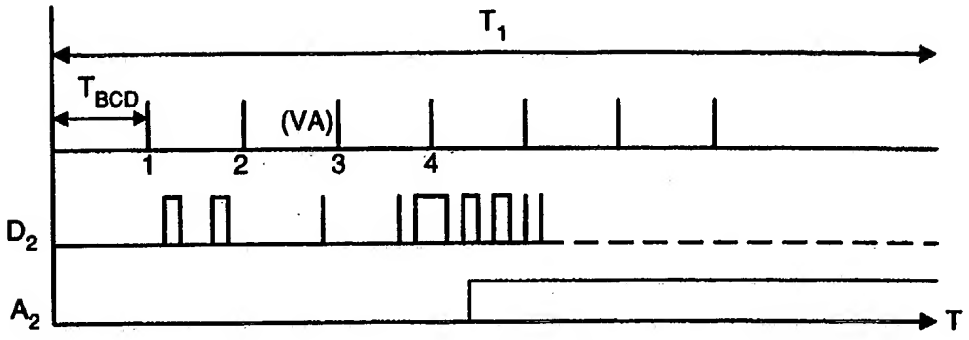


FIG. 15L

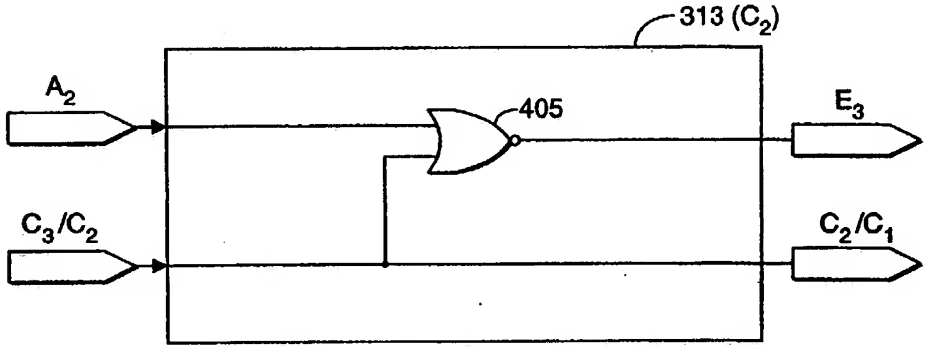


FIG. 15M

C_3 / C_2	A_2	E_3	C_2 / C_1
0	0	0	0
0	1	1	0
1	X	1	1

X: DON'T CARE (I.E. C_3 / C_2 OVERRIDES A_2)

FIG. 15N

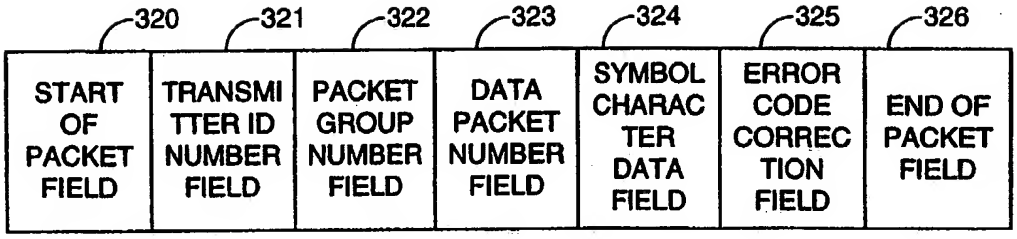


FIG. 15O

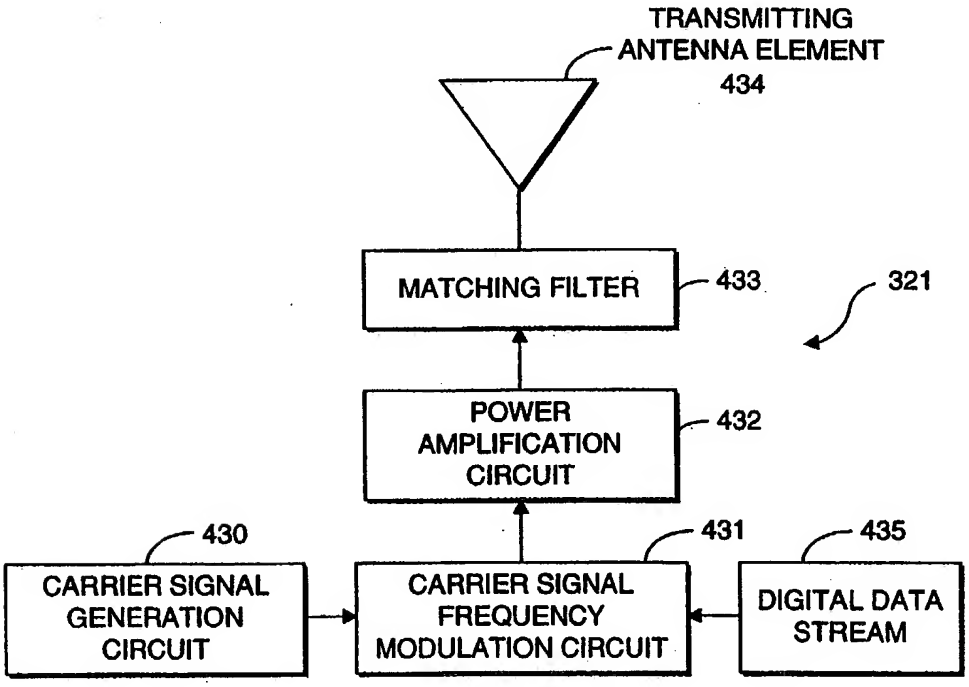


FIG. 16

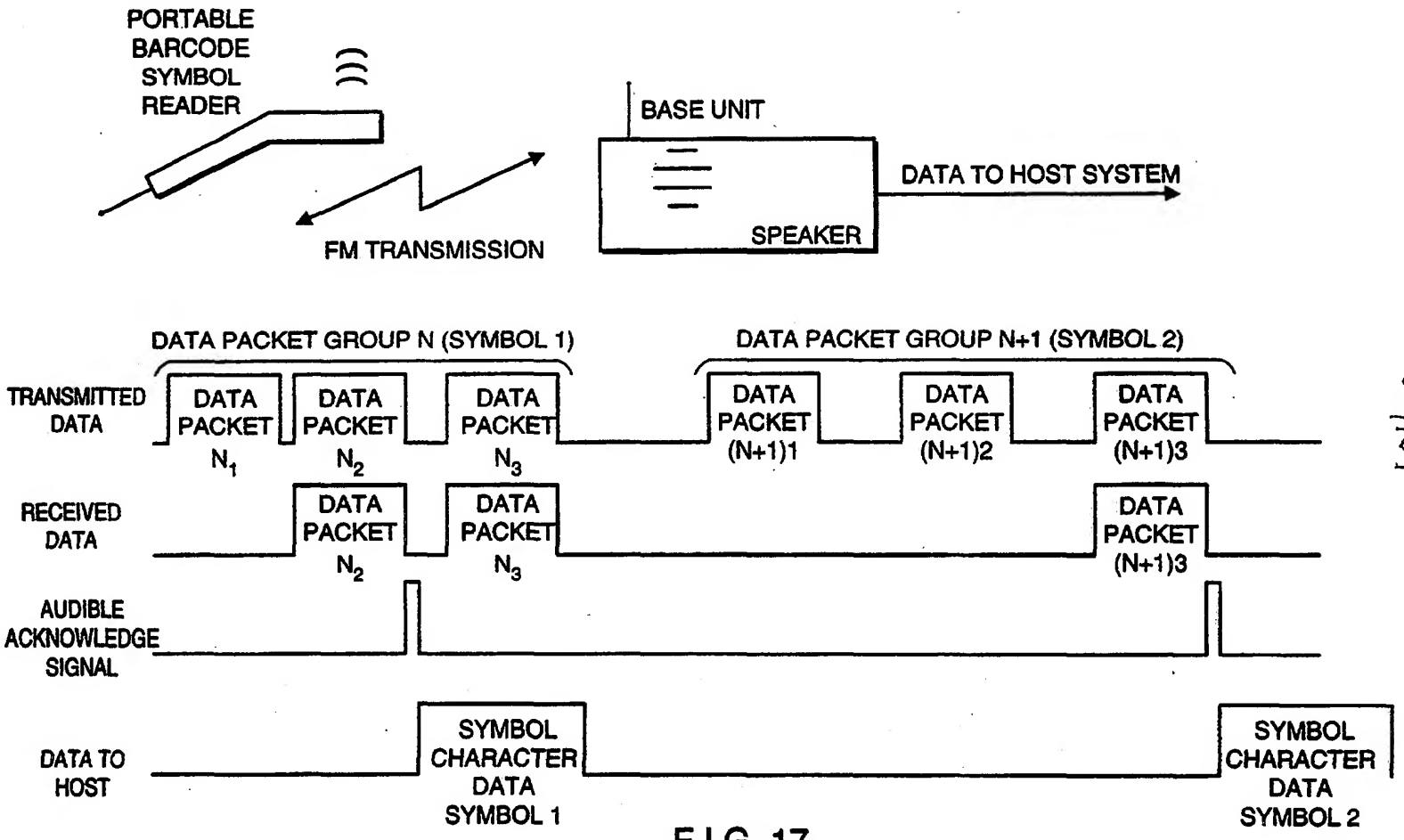

PORTABLE BARCODE SYMBOL READER
FM TRANSMISSION
BASE UNIT
SPEAKER
DATA TO HOST SYSTEM
DATA PACKET GROUP N (SYMBOL 1)
DATA PACKET GROUP N+1 (SYMBOL 2)
TRANSMITTED DATA
DATA PACKET N1
DATA PACKET N2
DATA PACKET N3
DATA PACKET (N+1)1
DATA PACKET (N+1)2
DATA PACKET (N+1)3
RECEIVED DATA
DATA PACKET N2
DATA PACKET N3
DATA PACKET (N+1)3
AUDIBLE ACKNOWLEDGE SIGNAL
DATA TO HOST
SYMBOL CHARACTER DATA SYMBOL 1
SYMBOL CHARACTER DATA SYMBOL 2

FIG. 17

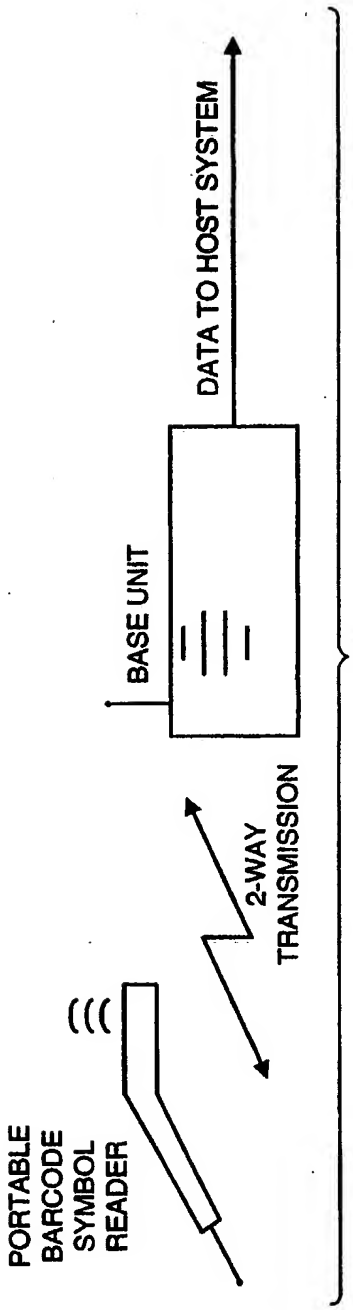

PORTABLE BARCODE SYMBOL READER
2-WAY TRANSMISSION
BASE UNIT
DATA TO HOST SYSTEM

FIG. 18

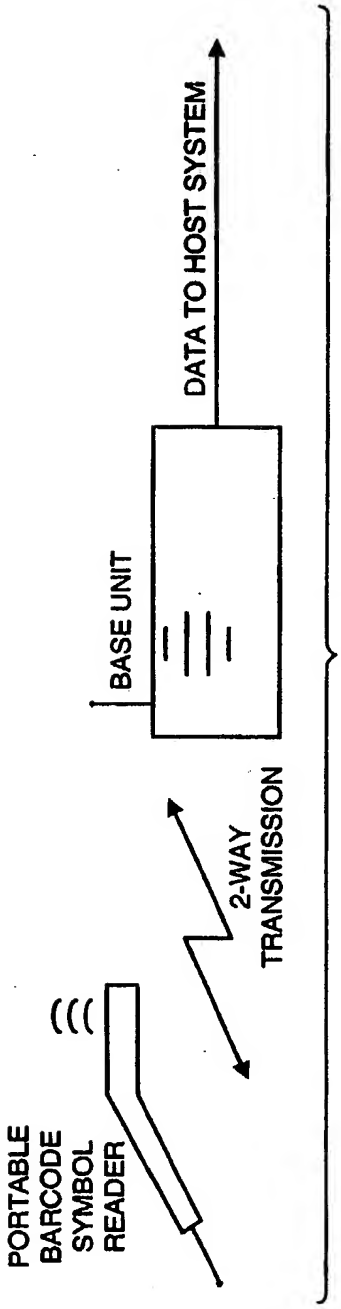

PORTABLE BARCODE SYMBOL READER
2-WAY TRANSMISSION
BASE UNIT
DATA TO HOST SYSTEM

FIG. 19

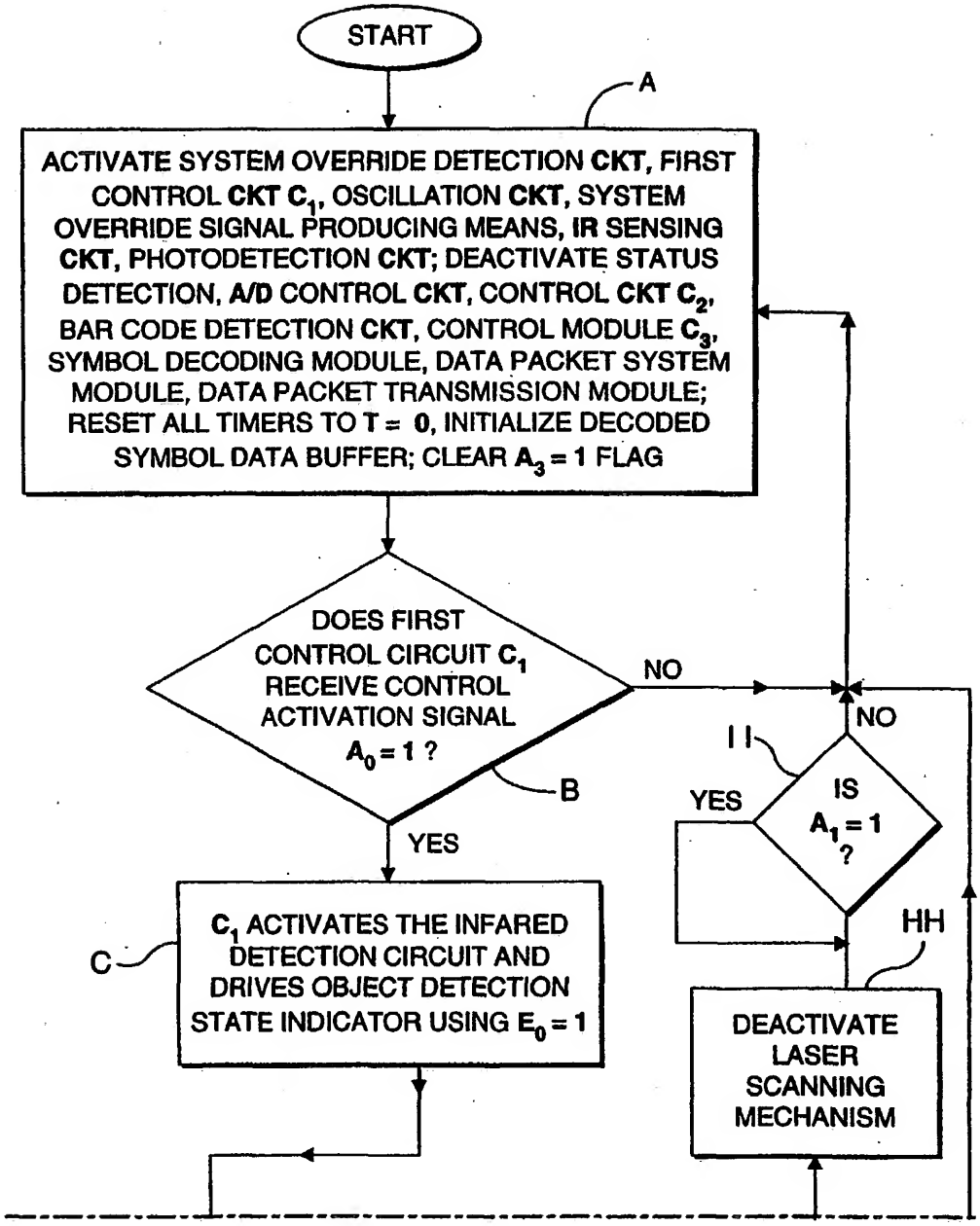

START
A
ACTIVATE SYSTEM OVERRIDE DETECTION CKT, FIRST CONTROL CKT C_1, OSCILLATION CKT, SYSTEM OVERRIDE SIGNAL PRODUCING MEANS, IR SENSING CKT, PHOTODETECTION CKT; DEACTIVATE STATUS DETECTION, A/D CONTROL CKT, CONTROL CKT C_2, BAR CODE DETECTION CKT, CONTROL MODULE C_3, SYMBOL DECODING MODULE, DATA PACKET SYSTEM MODULE, DATA PACKET TRANSMISSION MODULE; RESET ALL TIMERS TO T = 0, INITIALIZE DECODED SYMBOL DATA BUFFER; CLEAR $A_3 = 1$ FLAG
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL $A_0 = 1$?
NO
B
YES
C
C_1 ACTIVATES THE INFARED DETECTION CIRCUIT AND DRIVES OBJECT DETECTION STATE INDICATOR USING $E_0 = 1$
II
IS $A_1 = 1$?
YES
NO
HH
DEACTIVATE LASER SCANNING MECHANISM

FIG. 20A1

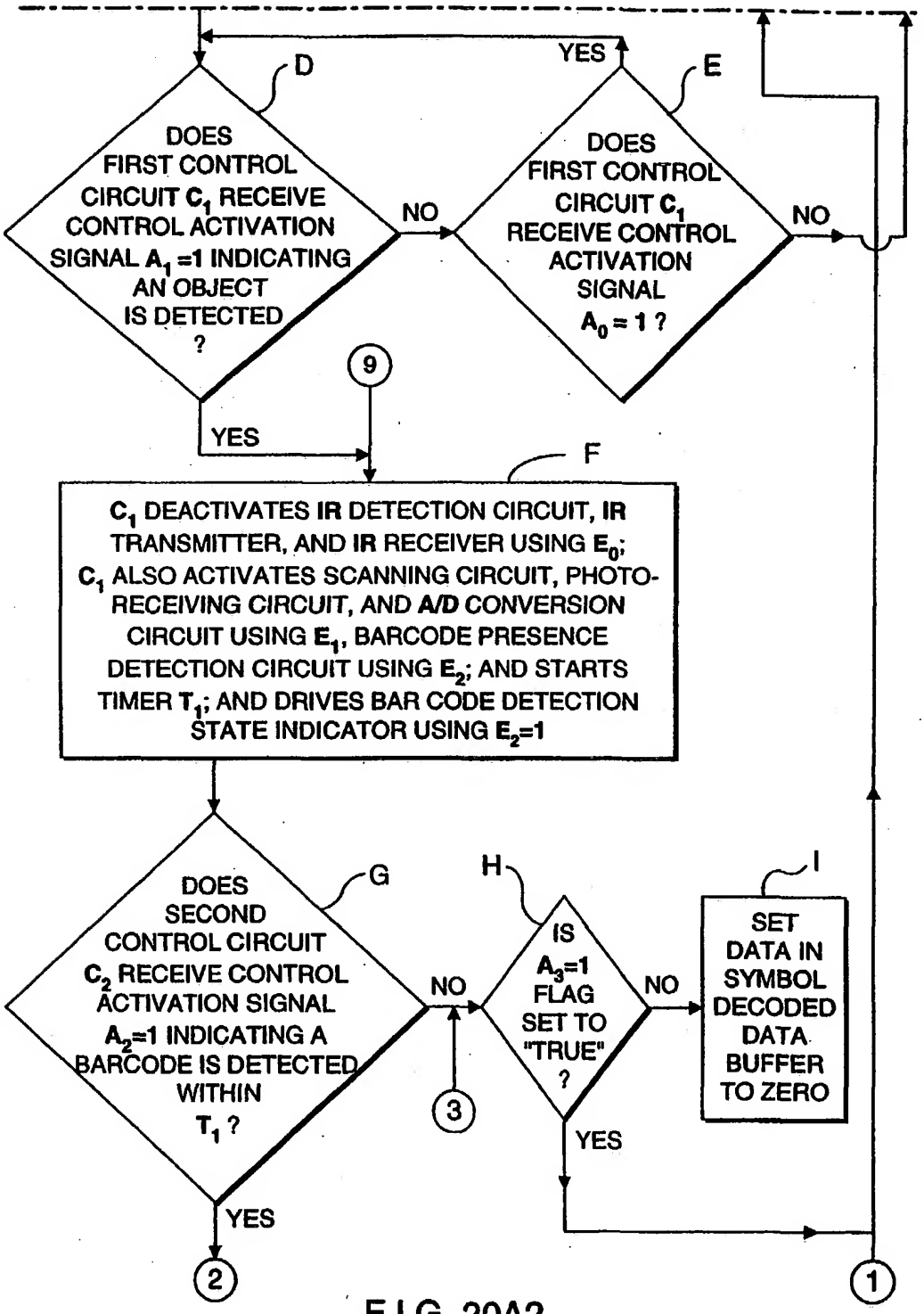

D
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_1 =1 INDICATING AN OBJECT IS DETECTED ?
NO
YES
E
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
NO
YES
9
F
C_1 DEACTIVATES IR DETECTION CIRCUIT, IR TRANSMITTER, AND IR RECEIVER USING E_0; C_1 ALSO ACTIVATES SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT, AND A/D CONVERSION CIRCUIT USING E_1, BARCODE PRESENCE DETECTION CIRCUIT USING E_2; AND STARTS TIMER T_1; AND DRIVES BAR CODE DETECTION STATE INDICATOR USING E_2=1
G
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 INDICATING A BARCODE IS DETECTED WITHIN T_1 ?
NO
YES
H
IS A_3=1 FLAG SET TO "TRUE" ?
NO
YES
I
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
3
2
1

FIG. 20A2

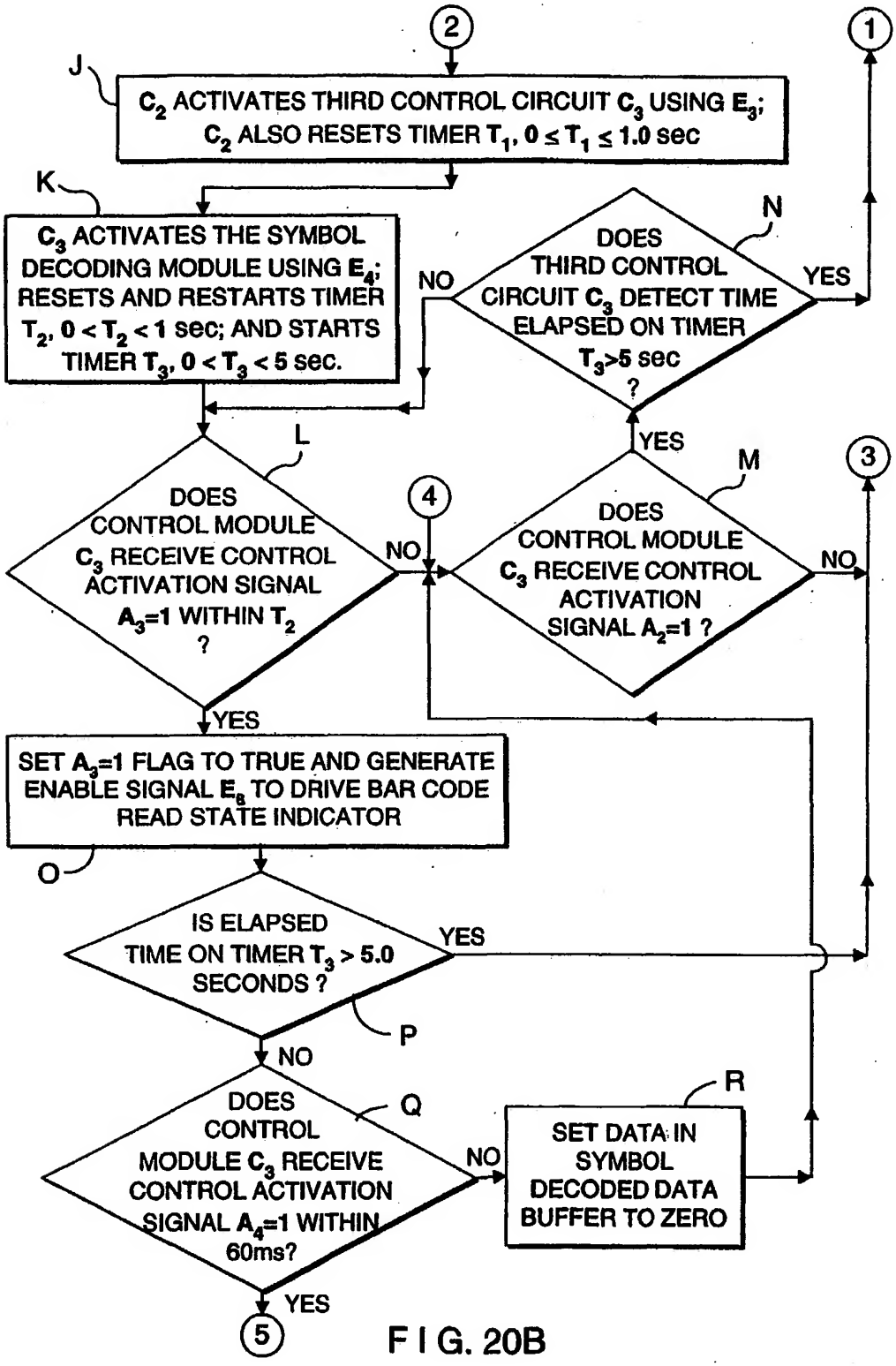

2
1
J
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3; C_2 ALSO RESETS TIMER T_1, $0 \le T_1 \le 1.0$ sec
K
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4; RESETS AND RESTARTS TIMER T_2, $0 < T_2 < 1$ sec; AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
N
DOES THIRD CONTROL CIRCUIT C_3 DETECT TIME ELAPSED ON TIMER T_3>5 sec ?
NO
YES
L
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 ?
4
NO
M
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 ?
NO
3
YES
YES
SET A_3=1 FLAG TO TRUE AND GENERATE ENABLE SIGNAL E_8 TO DRIVE BAR CODE READ STATE INDICATOR
O
IS ELAPSED TIME ON TIMER T_3 > 5.0 SECONDS ?
YES
P
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_4=1 WITHIN 60ms?
Q
NO
R
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
YES
5

FIG. 20B

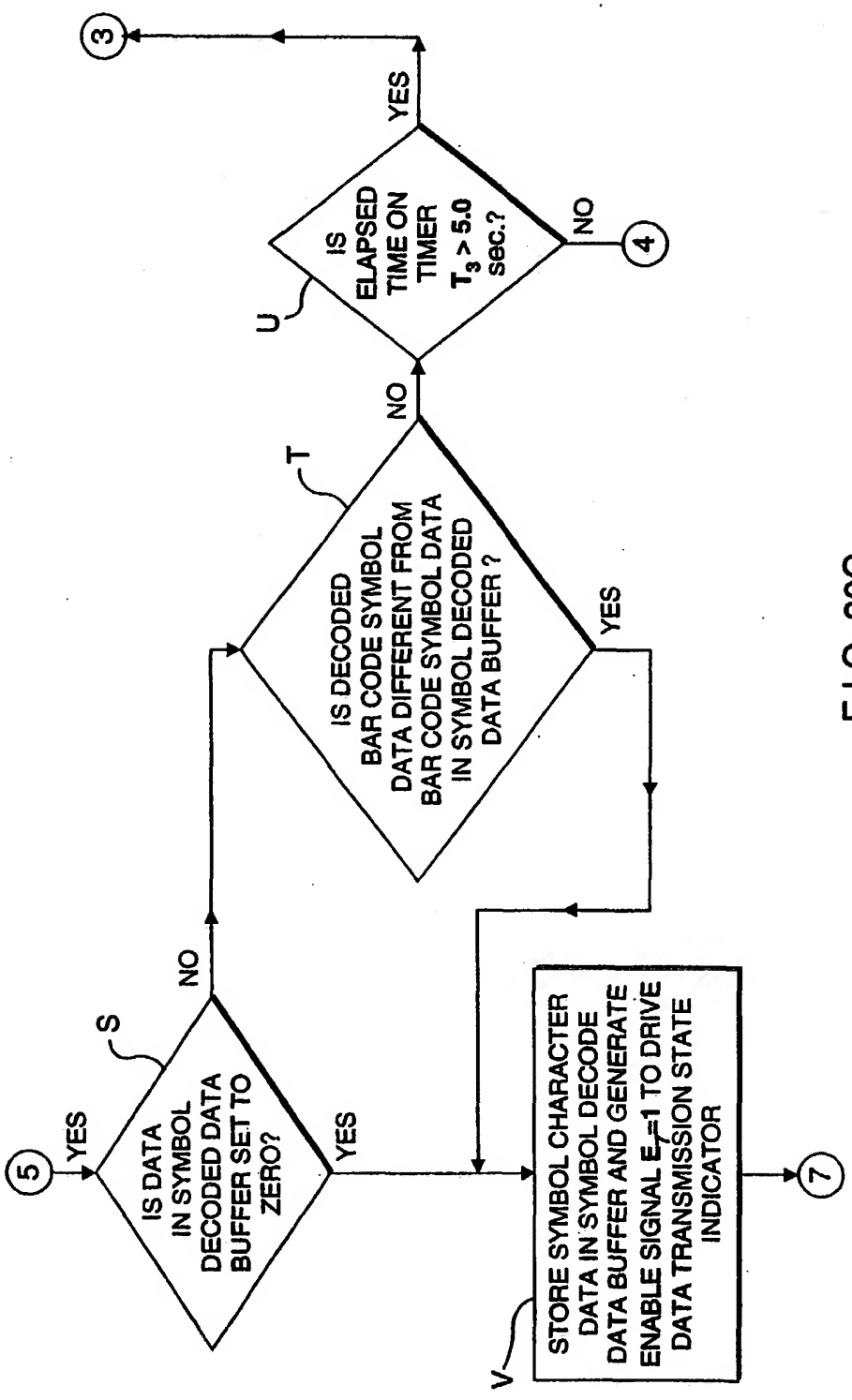

5
YES
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
S
NO
YES
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
T
NO
YES
IS ELAPSED TIME ON TIMER $T_3 > 5.0$ sec.?
U
YES
NO
3
4
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER AND GENERATE ENABLE SIGNAL E_T=1 TO DRIVE DATA TRANSMISSION STATE INDICATOR
V
7

FIG. 20C

60/171

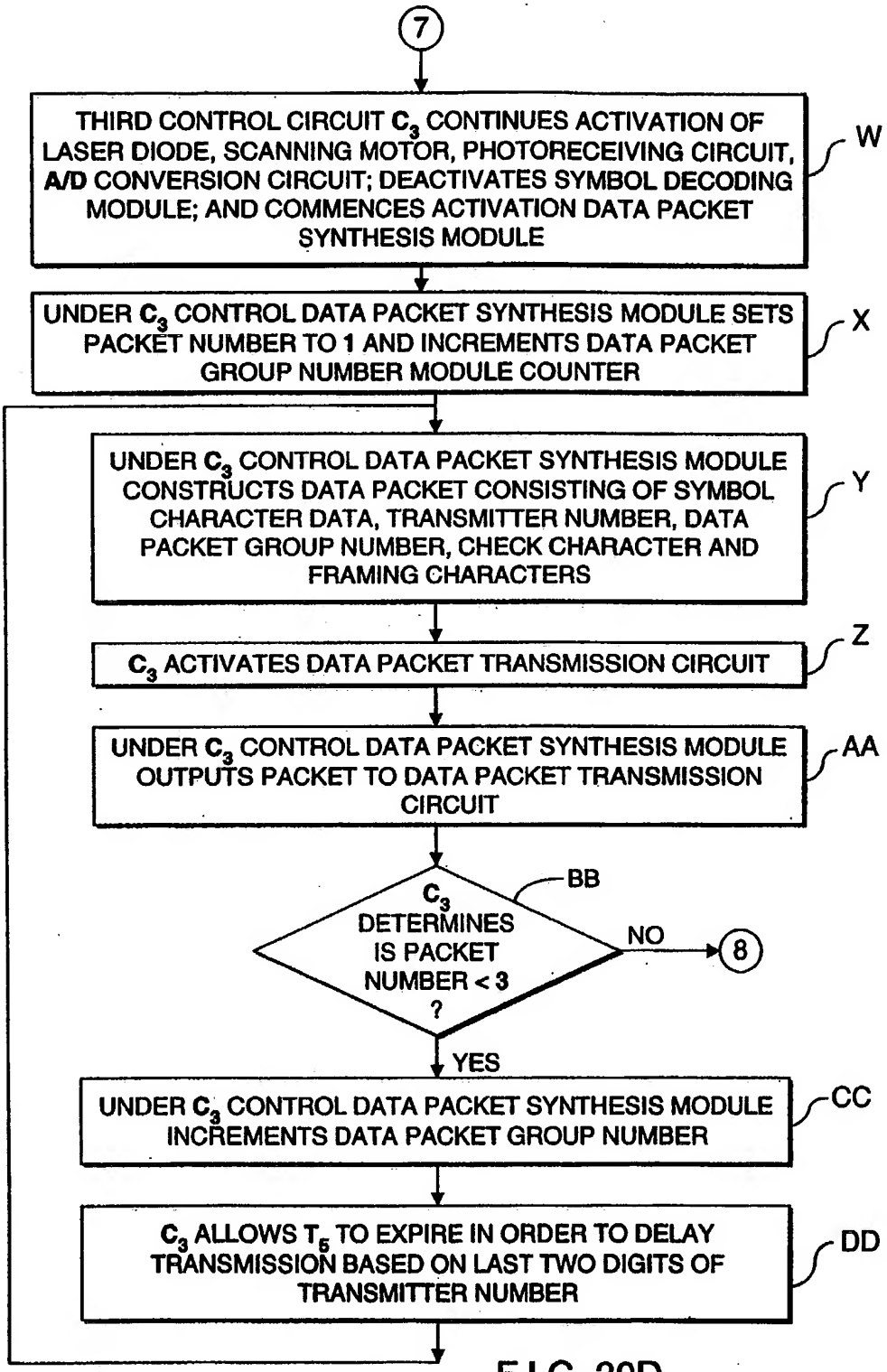


FIG. 20D

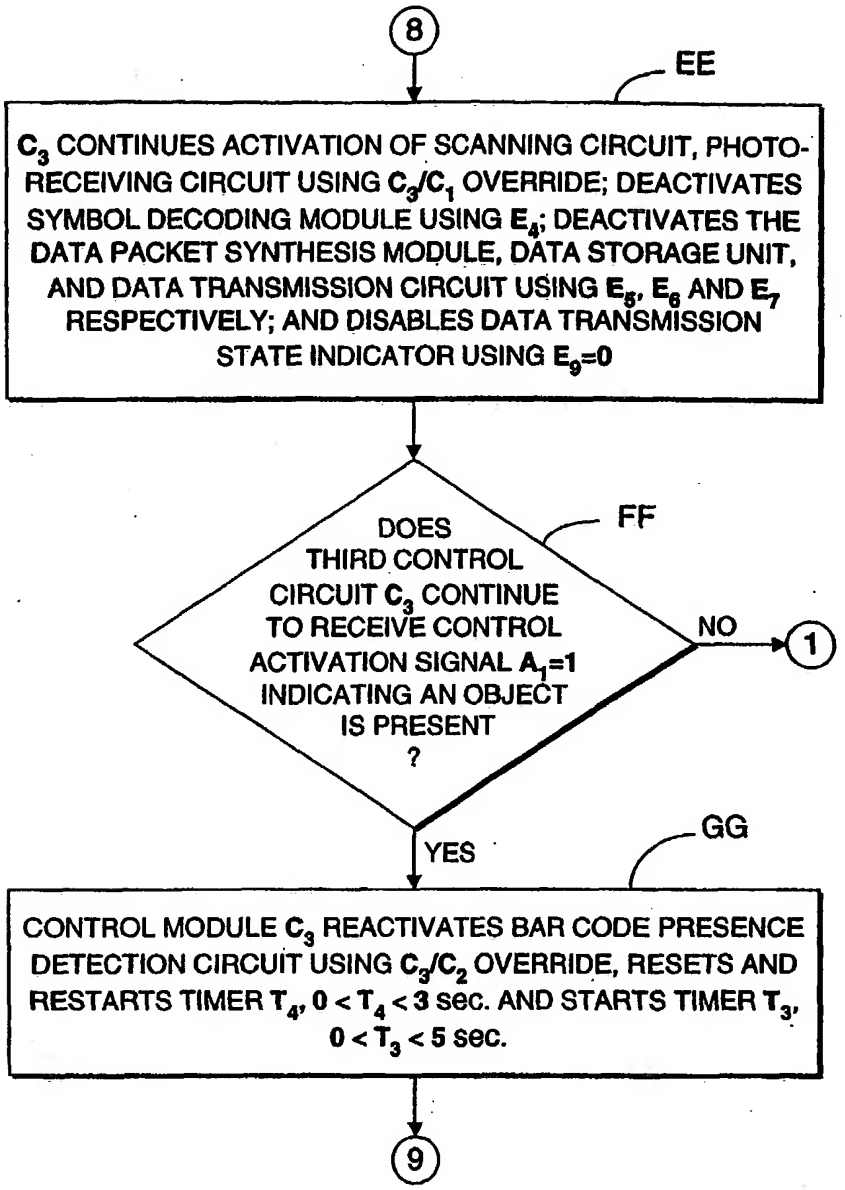

8
EE
C3 CONTINUES ACTIVATION OF SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT USING C3/C1 OVERRIDE; DEACTIVATES SYMBOL DECODING MODULE USING E4; DEACTIVATES THE DATA PACKET SYNTHESIS MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT USING E5, E6 AND E7 RESPECTIVELY; AND DISABLES DATA TRANSMISSION STATE INDICATOR USING E9=0
FF
DOES THIRD CONTROL CIRCUIT C3 CONTINUE TO RECEIVE CONTROL ACTIVATION SIGNAL A1=1 INDICATING AN OBJECT IS PRESENT ?
NO
1
YES
GG
CONTROL MODULE C3 REACTIVATES BAR CODE PRESENCE DETECTION CIRCUIT USING C3/C2 OVERRIDE, RESETS AND RESTARTS TIMER T4, 0 < T4 < 3 sec. AND STARTS TIMER T3, 0 < T3 < 5 sec.
9

FIG. 20E

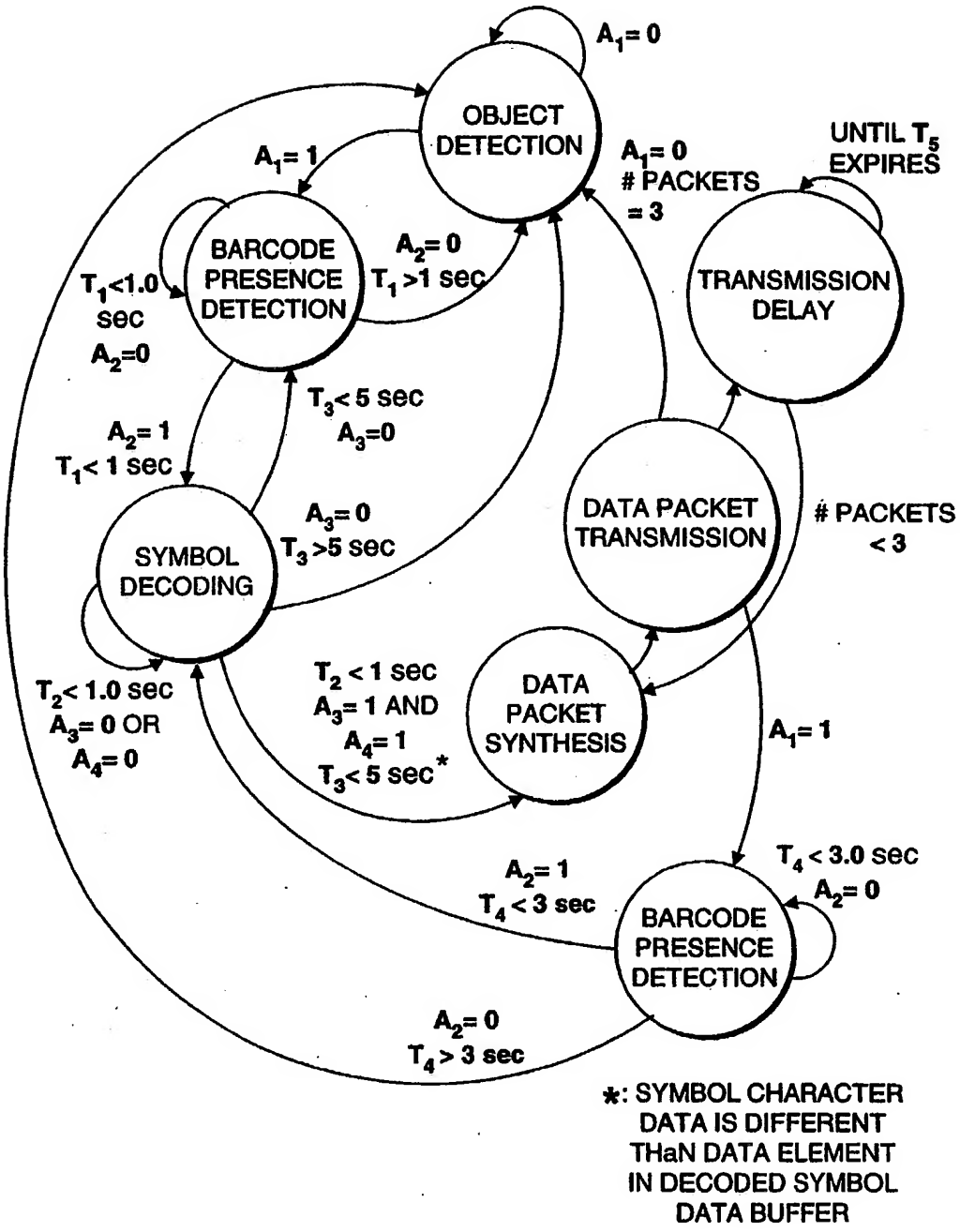

OBJECT DETECTION
BARCODE PRESENCE DETECTION
SYMBOL DECODING
DATA PACKET SYNTHESIS
DATA PACKET TRANSMISSION
TRANSMISSION DELAY
BARCODE PRESENCE DETECTION
A1= 0
A1= 1
A1= 0 # PACKETS = 3
UNTIL T5 EXPIRES
T1<1.0 sec A2=0
A2= 0 T1 >1 sec
A2= 1 T1< 1 sec
T3< 5 sec A3=0
A3= 0 T3 >5 sec
# PACKETS < 3
T2< 1.0 sec A3= 0 OR A4= 0
T2 < 1 sec A3= 1 AND A4= 1 T3< 5 sec*
A1= 1
T4 < 3.0 sec A2= 0
A2= 1 T4 < 3 sec
A2= 0 T4 > 3 sec
*: SYMBOL CHARACTER DATA IS DIFFERENT THaN DATA ELEMENT IN DECODED SYMBOL DATA BUFFER

FIG. 21

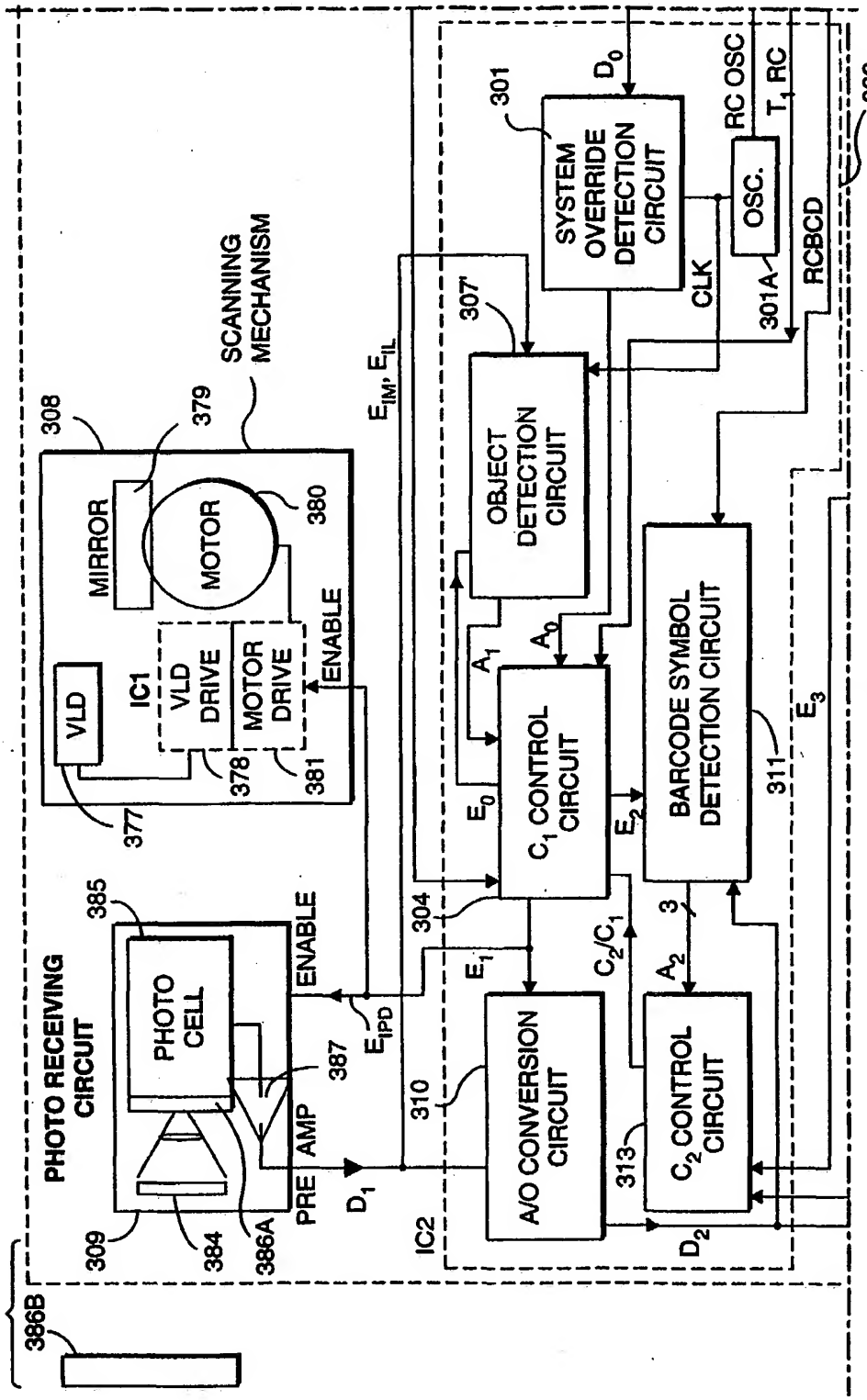

386B
PHOTO RECEIVING CIRCUIT
385
PHOTO CELL
309
384
386A
387
PRE AMP
ENABLE
E_{IPD}
D_1
IC2
310
A/O CONVERSION CIRCUIT
304
E_1
E_0
C_1 CONTROL CIRCUIT
A_1
A_0
E_2
C_2/C_1
A_2
3
313
C_2 CONTROL CIRCUIT
D_2
BARCODE SYMBOL DETECTION CIRCUIT
311
E_3
OBJECT DETECTION CIRCUIT
307'
E_{IM}, E_{IL}
SYSTEM OVERRIDE DETECTION CIRCUIT
301
D_0
CLK
OSC.
301A
RC OSC
T_1 RC
RCBCD
333
SCANNING MECHANISM
308
MIRROR
379
MOTOR
380
ENABLE
VLD
IC1
VLD DRIVE
MOTOR DRIVE
378
381
377

FIG. 22A1

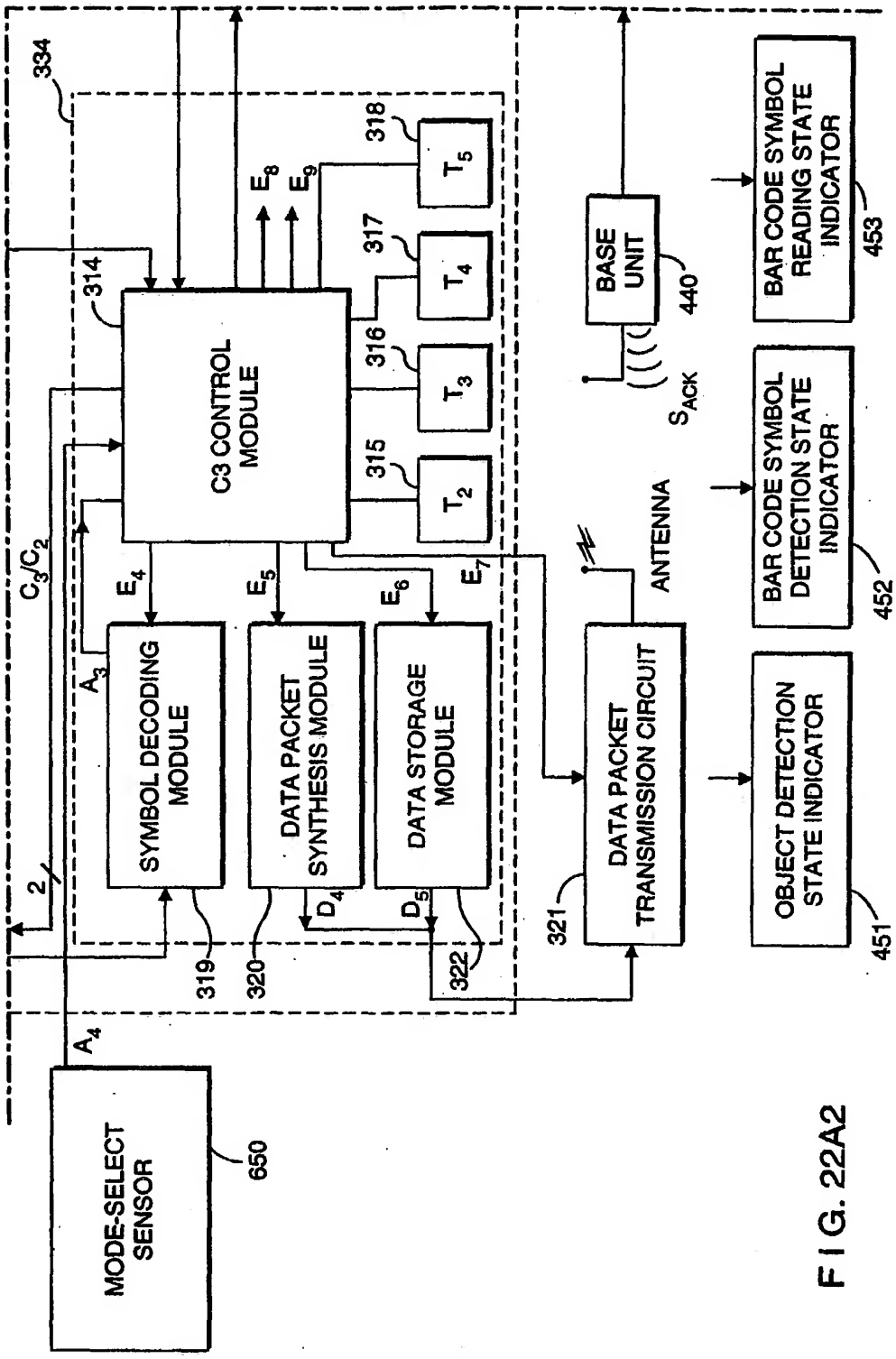

334
314
C3 CONTROL MODULE
318
317
316
315
T_5
T_4
T_3
T_2
E_8
E_9
E_4
E_5
E_6
E_7
C_3/C_2
A_3
A_4
2
SYMBOL DECODING MODULE
DATA PACKET SYNTHESIS MODULE
DATA STORAGE MODULE
D_4
D_5
319
320
322
321
DATA PACKET TRANSMISSION CIRCUIT
ANTENNA
S_{ACK}
BASE UNIT
440
MODE-SELECT SENSOR
650
OBJECT DETECTION STATE INDICATOR
451
BAR CODE SYMBOL DETECTION STATE INDICATOR
452
BAR CODE SYMBOL READING STATE INDICATOR
453

FIG. 22A2

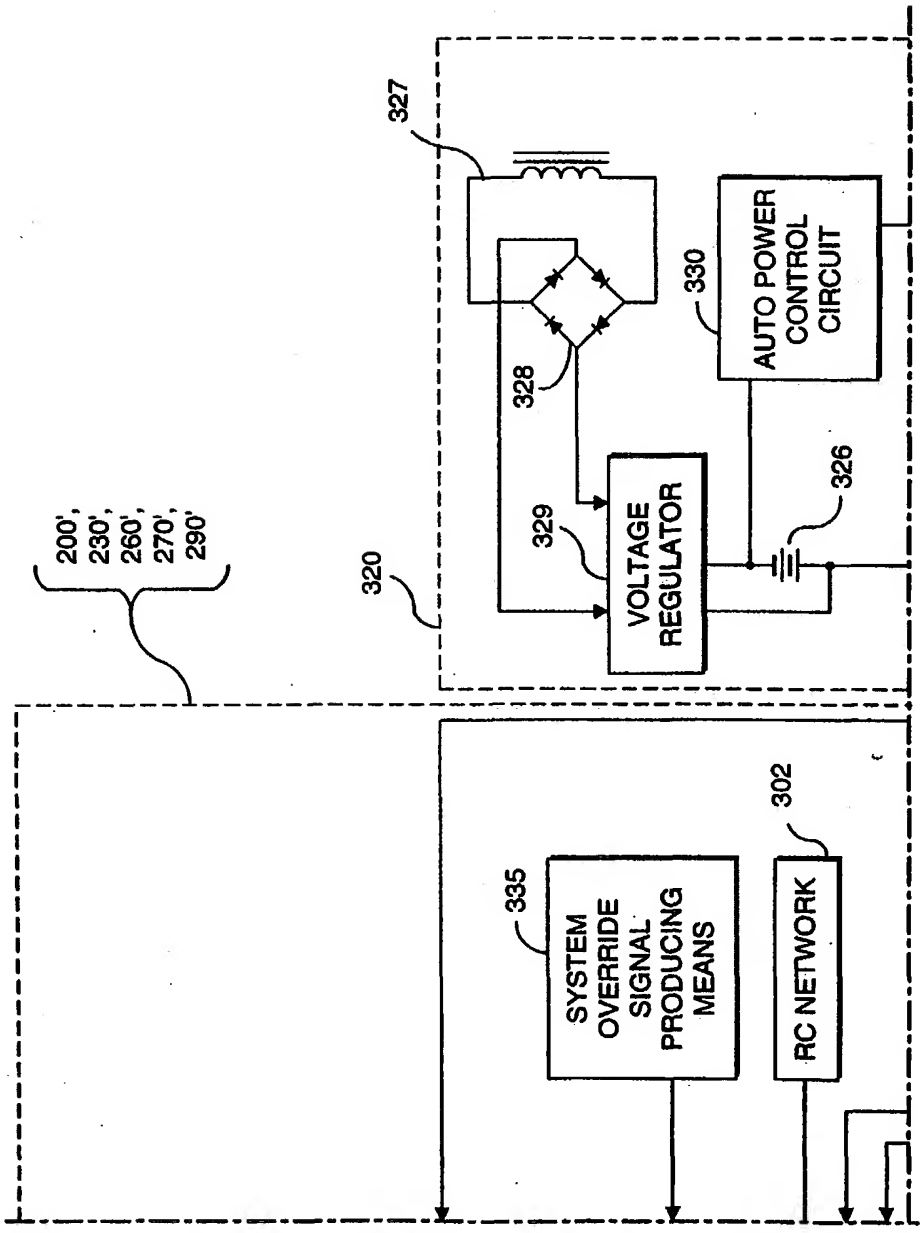

200',
230',
260',
270',
290'
320
327
328
329
326
330
VOLTAGE REGULATOR
AUTO POWER CONTROL CIRCUIT
335
SYSTEM OVERRIDE SIGNAL PRODUCING MEANS
302
RC NETWORK

FIG. 22A3

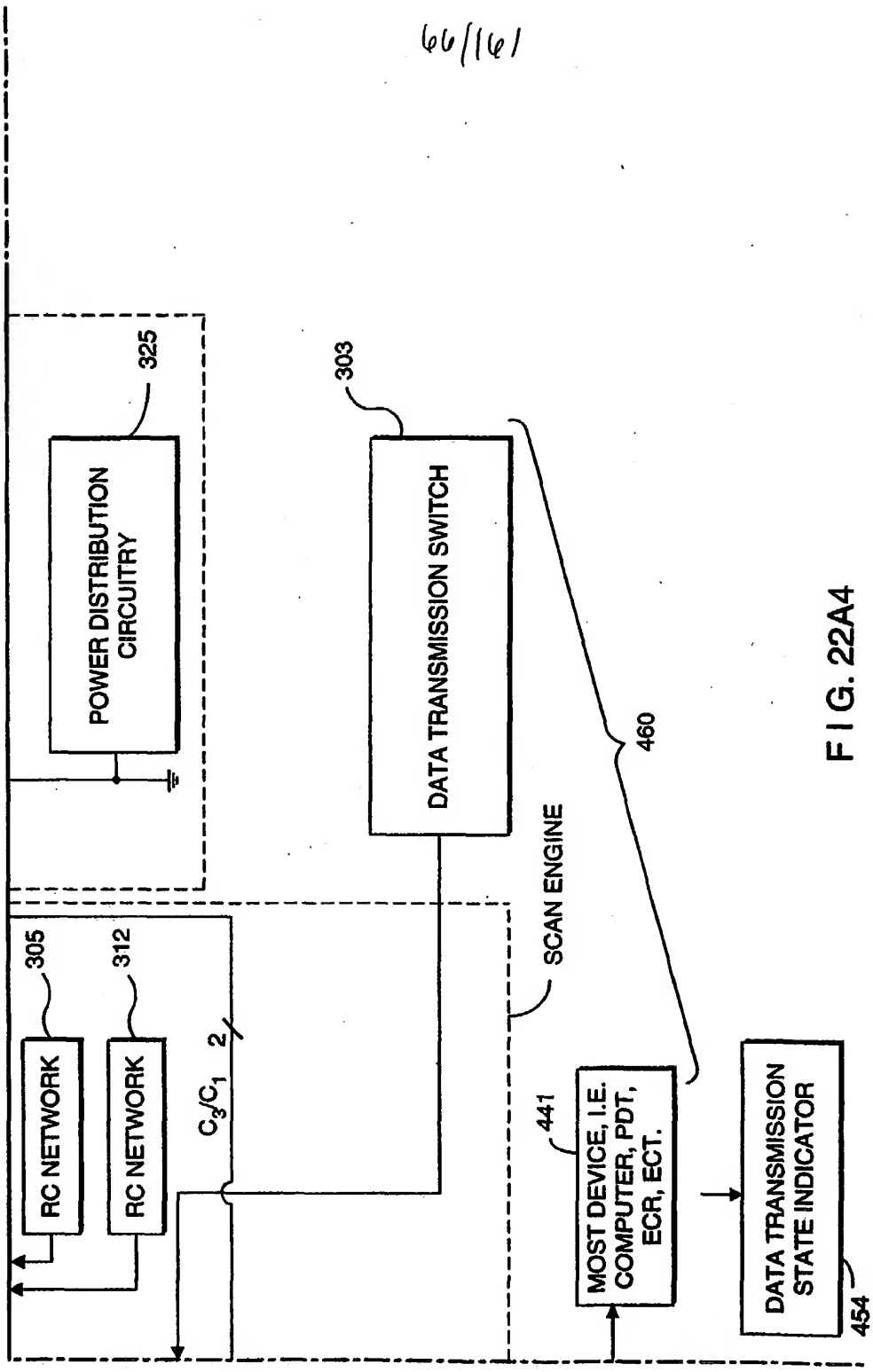

325
POWER DISTRIBUTION CIRCUITRY
303
DATA TRANSMISSION SWITCH
460
SCAN ENGINE
305
RC NETWORK
312
RC NETWORK
C_3/C_1 2
441
MOST DEVICE, I.E. COMPUTER, PDT, ECR, ECT.
DATA TRANSMISSION STATE INDICATOR
454

FIG. 22A4

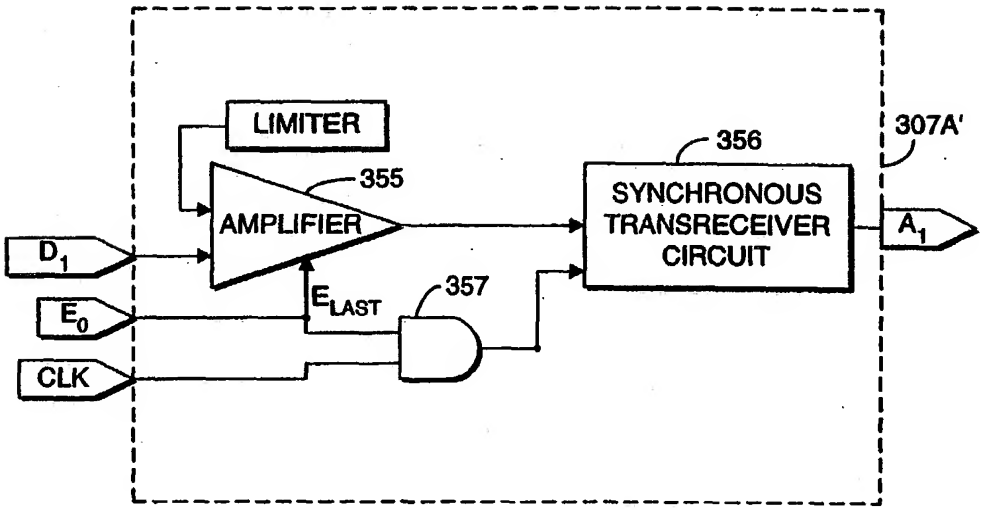

LIMITER
355
AMPLIFIER
356
SYNCHRONOUS
TRANSRECEIVER
CIRCUIT
307A'
D1
A1
E0
ELAST
357
CLK

FIG. 22B

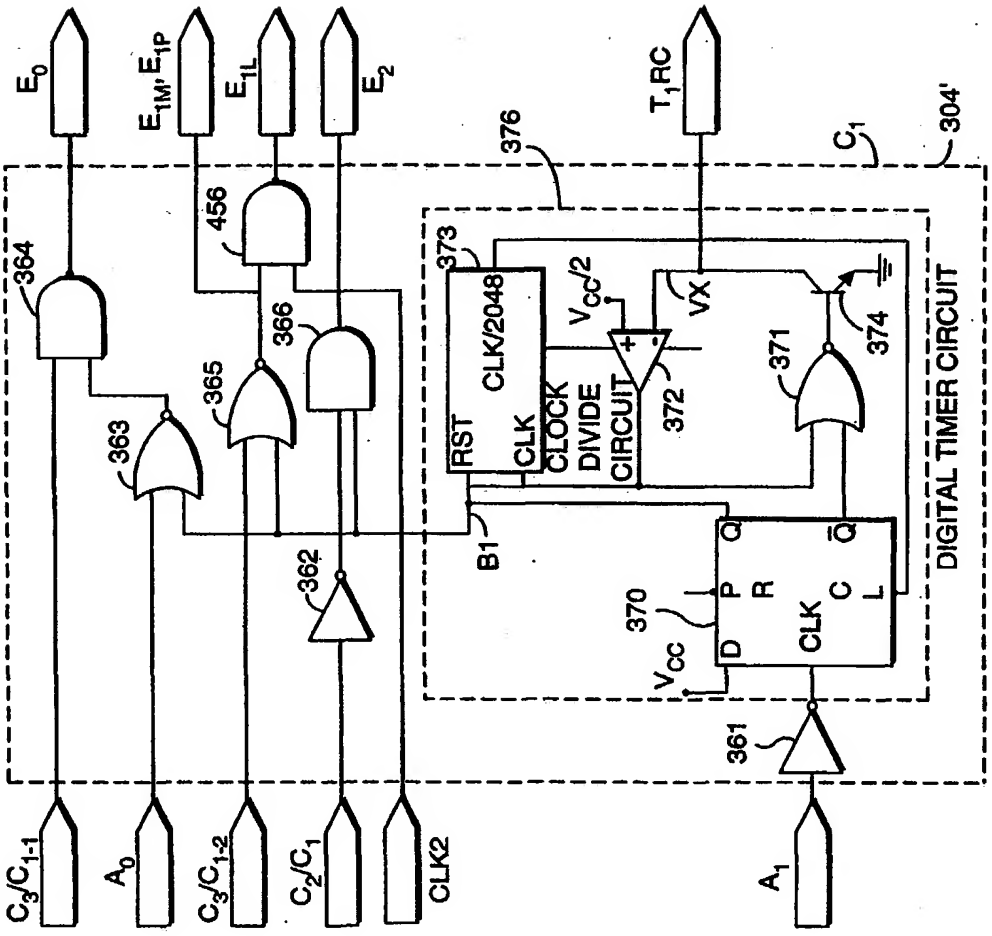

E_0
E_{1M}, E_{1P}
E_{1L}
E_2
T_1RC
376
C_1
304'
364
456
373
366
$V_{CC}/2$
VX
365
CLK/2048
CLOCK DIVIDE CIRCUIT
372
371
374
363
RST
CLK
B1
362
Q
$\bar{Q}$
370
P
R
C
L
D
CLK
V_{CC}
DIGITAL TIMER CIRCUIT
361
C_3/C_{1-1}
A_0
C_3/C_{1-2}
C_2/C_1
CLK2
A_1

FIG. 22C

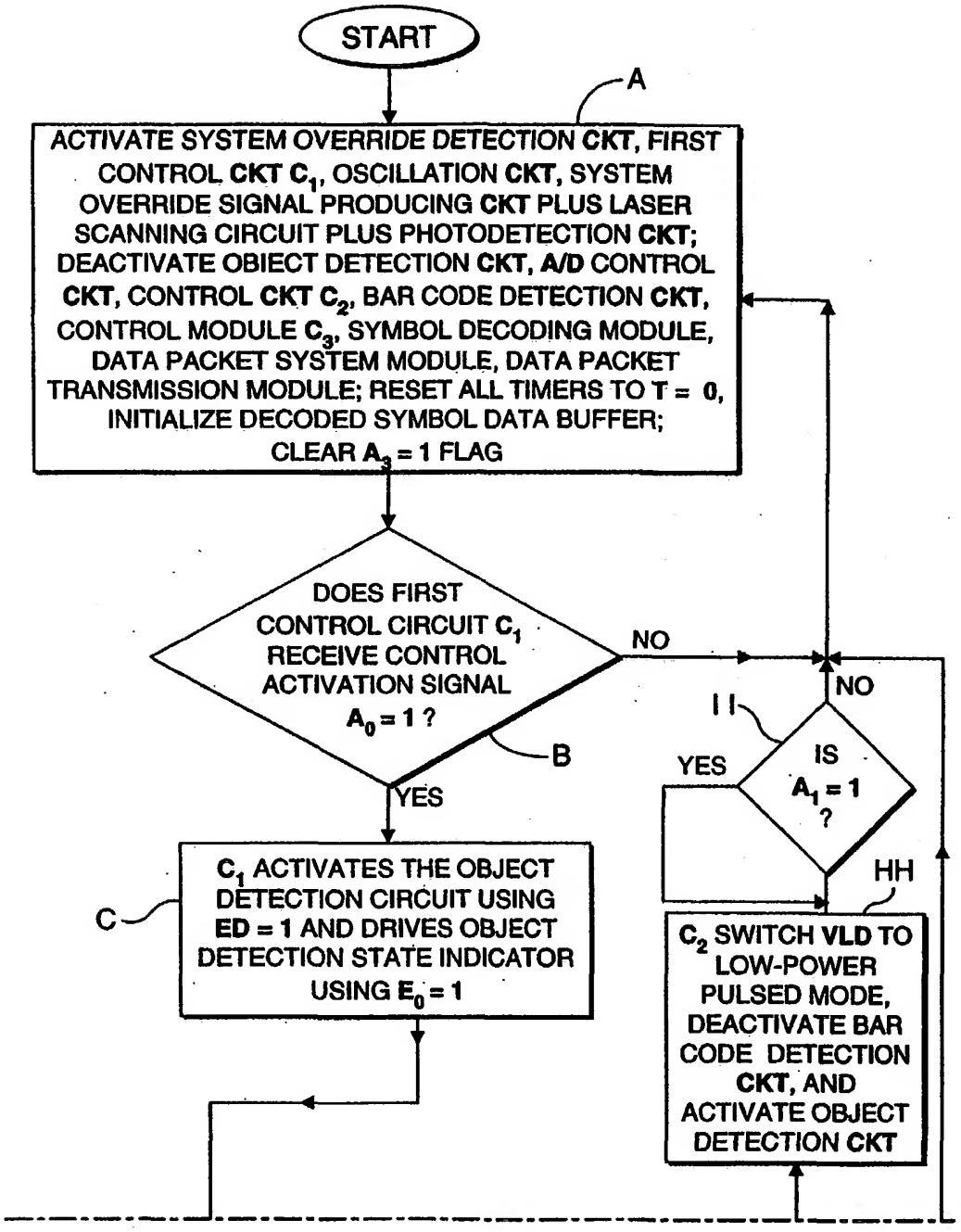

START
A
ACTIVATE SYSTEM OVERRIDE DETECTION CKT, FIRST CONTROL CKT C_1, OSCILLATION CKT, SYSTEM OVERRIDE SIGNAL PRODUCING CKT PLUS LASER SCANNING CIRCUIT PLUS PHOTODETECTION CKT; DEACTIVATE OBIECT DETECTION CKT, A/D CONTROL CKT, CONTROL CKT C_2, BAR CODE DETECTION CKT, CONTROL MODULE C_3, SYMBOL DECODING MODULE, DATA PACKET SYSTEM MODULE, DATA PACKET TRANSMISSION MODULE; RESET ALL TIMERS TO T = 0, INITIALIZE DECODED SYMBOL DATA BUFFER; CLEAR A_3 = 1 FLAG
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
NO
B
YES
C
C_1 ACTIVATES THE OBJECT DETECTION CIRCUIT USING ED = 1 AND DRIVES OBJECT DETECTION STATE INDICATOR USING E_0 = 1
II
NO
IS A_1 = 1 ?
YES
HH
C_2 SWITCH VLD TO LOW-POWER PULSED MODE, DEACTIVATE BAR CODE DETECTION CKT, AND ACTIVATE OBJECT DETECTION CKT

FIG. 23A1

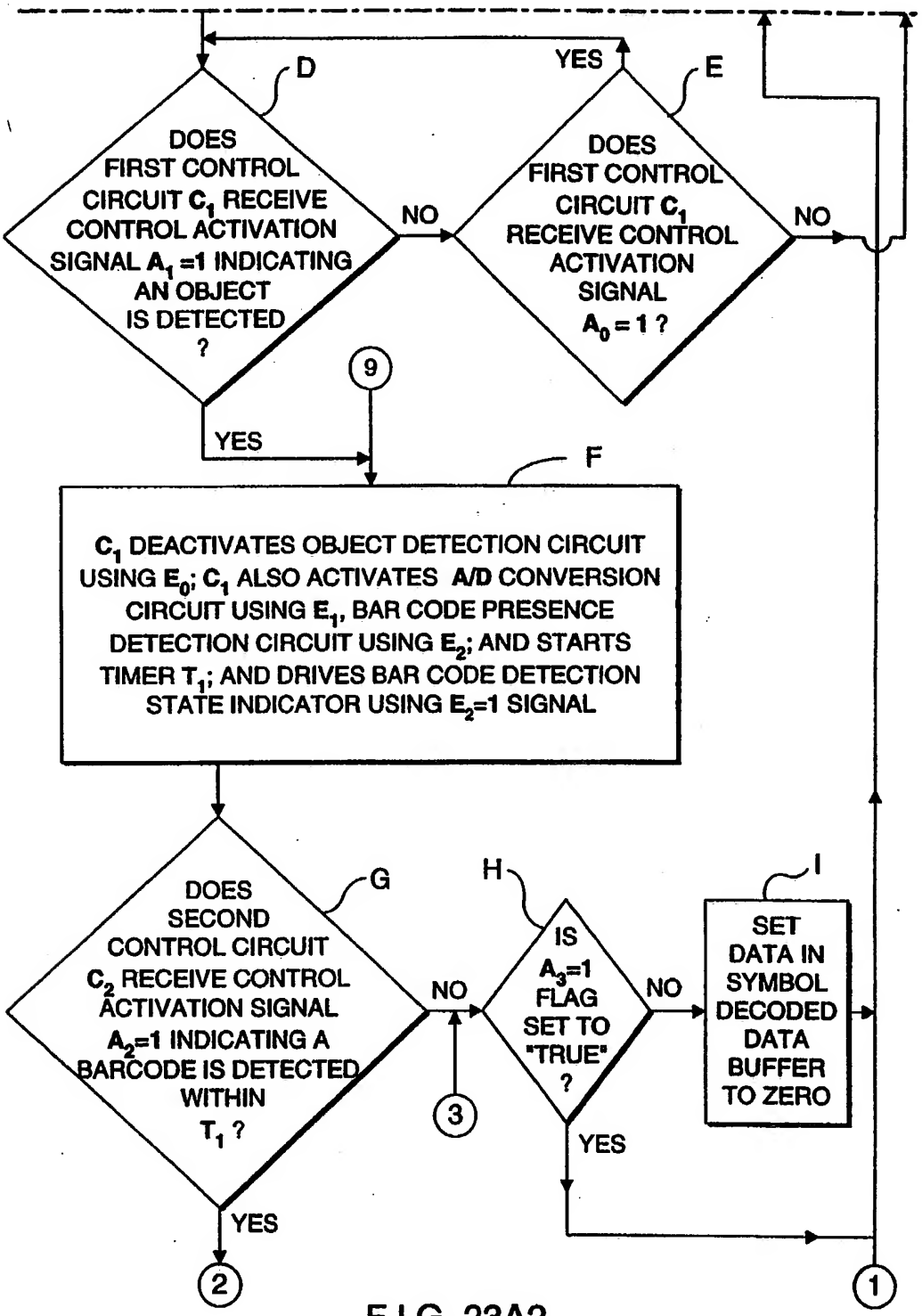

D
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_1 =1 INDICATING AN OBJECT IS DETECTED ?
NO
YES
E
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
NO
9
YES
F
C_1 DEACTIVATES OBJECT DETECTION CIRCUIT USING E_0; C_1 ALSO ACTIVATES A/D CONVERSION CIRCUIT USING E_1, BAR CODE PRESENCE DETECTION CIRCUIT USING E_2; AND STARTS TIMER T_1; AND DRIVES BAR CODE DETECTION STATE INDICATOR USING E_2=1 SIGNAL
G
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 INDICATING A BARCODE IS DETECTED WITHIN T_1 ?
NO
H
IS A_3=1 FLAG SET TO "TRUE" ?
NO
I
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
YES
3
YES
2
1

FIG. 23A2

71/116.1

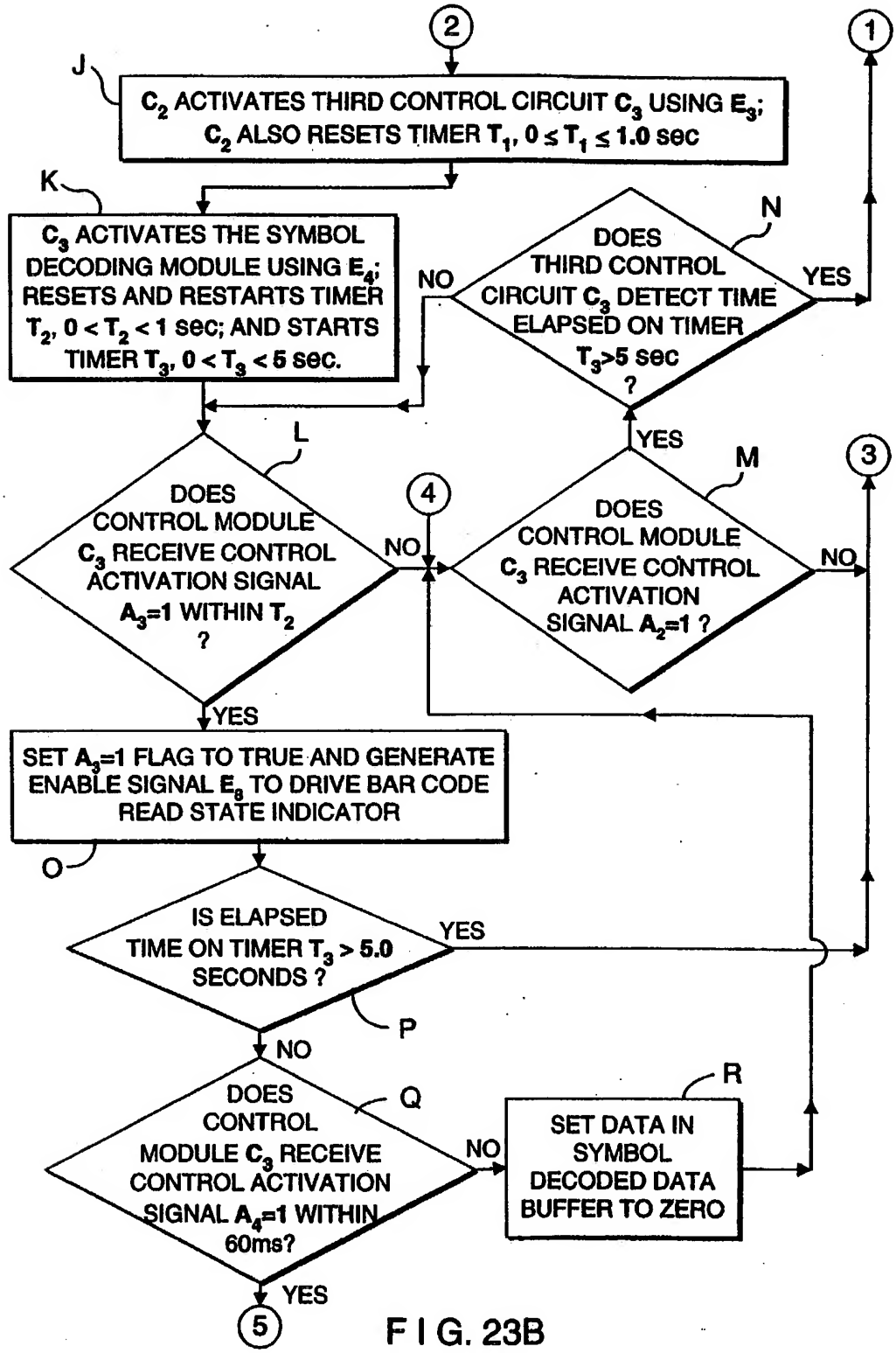


FIG. 23B

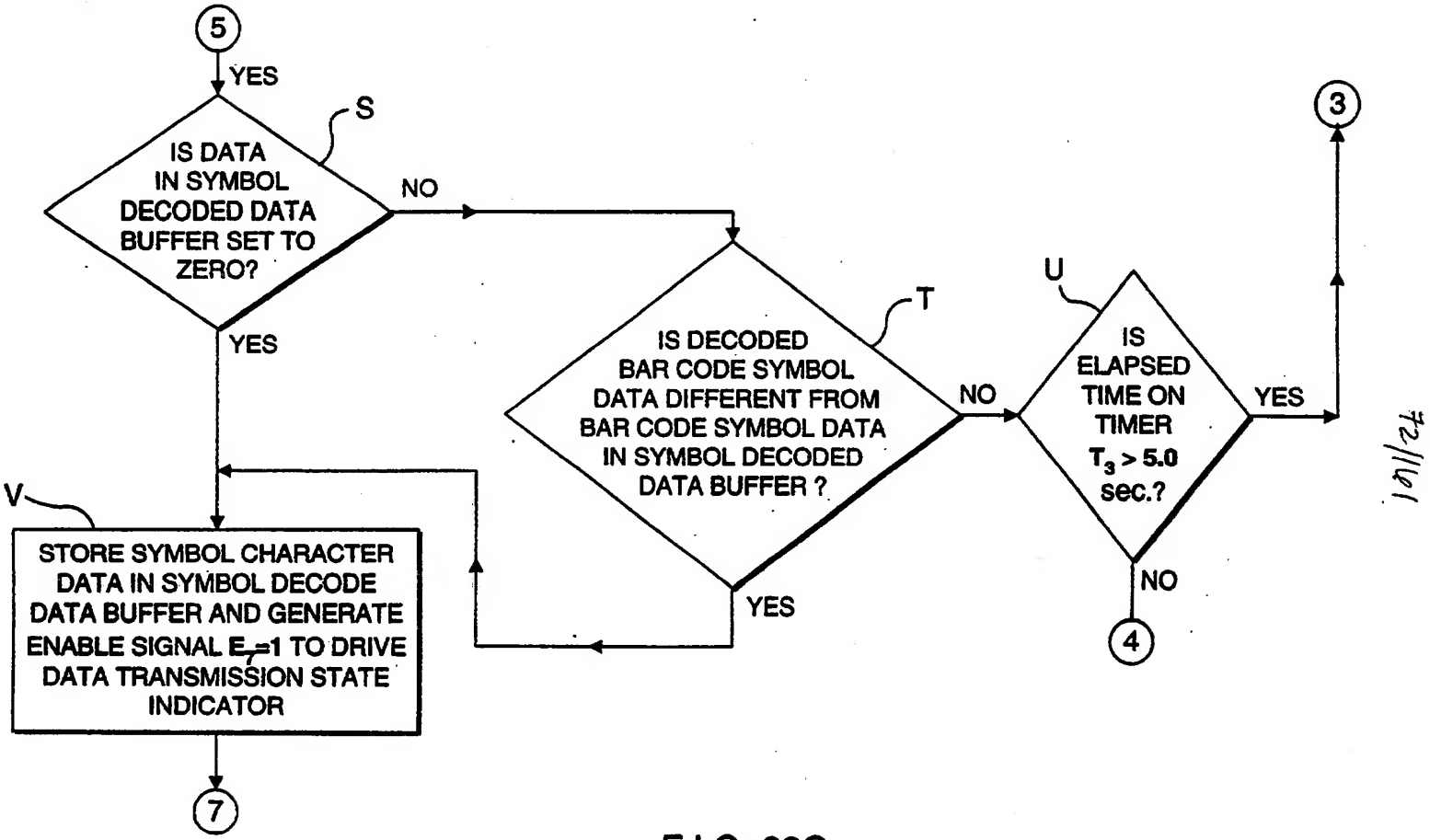

5
YES
S
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
NO
YES
T
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
NO
YES
U
IS ELAPSED TIME ON TIMER $T_3 > 5.0$ sec.?
YES
NO
3
4
V
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER AND GENERATE ENABLE SIGNAL E_7=1 TO DRIVE DATA TRANSMISSION STATE INDICATOR
7

FIG. 23C

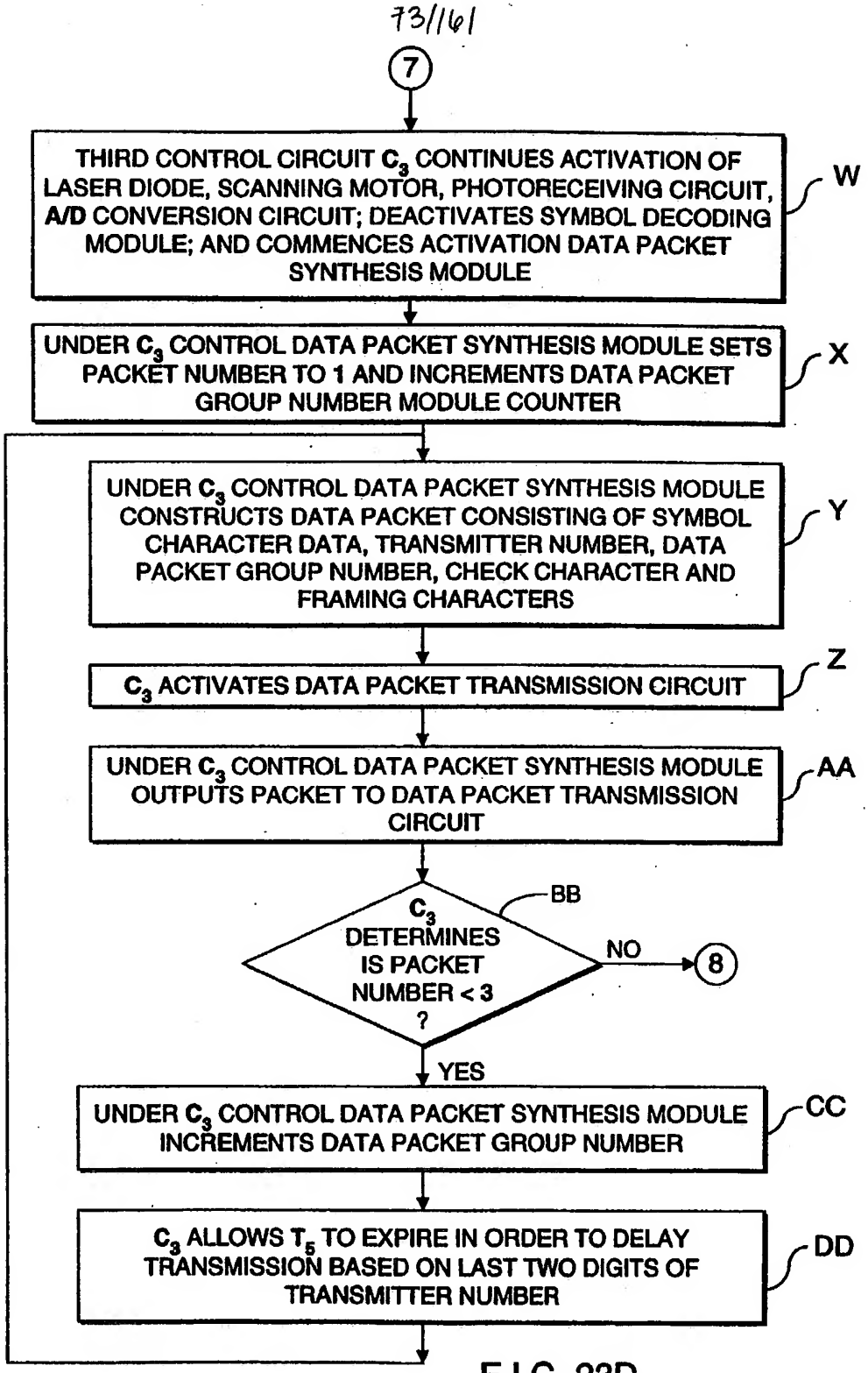

7
THIRD CONTROL CIRCUIT C_3 CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION DATA PACKET SYNTHESIS MODULE
W
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE SETS PACKET NUMBER TO 1 AND INCREMENTS DATA PACKET GROUP NUMBER MODULE COUNTER
X
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE CONSTRUCTS DATA PACKET CONSISTING OF SYMBOL CHARACTER DATA, TRANSMITTER NUMBER, DATA PACKET GROUP NUMBER, CHECK CHARACTER AND FRAMING CHARACTERS
Y
C_3 ACTIVATES DATA PACKET TRANSMISSION CIRCUIT
Z
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE OUTPUTS PACKET TO DATA PACKET TRANSMISSION CIRCUIT
AA
C_3 DETERMINES IS PACKET NUMBER < 3 ?
BB
NO
8
YES
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE INCREMENTS DATA PACKET GROUP NUMBER
CC
C_3 ALLOWS T_5 TO EXPIRE IN ORDER TO DELAY TRANSMISSION BASED ON LAST TWO DIGITS OF TRANSMITTER NUMBER
DD

FIG. 23D

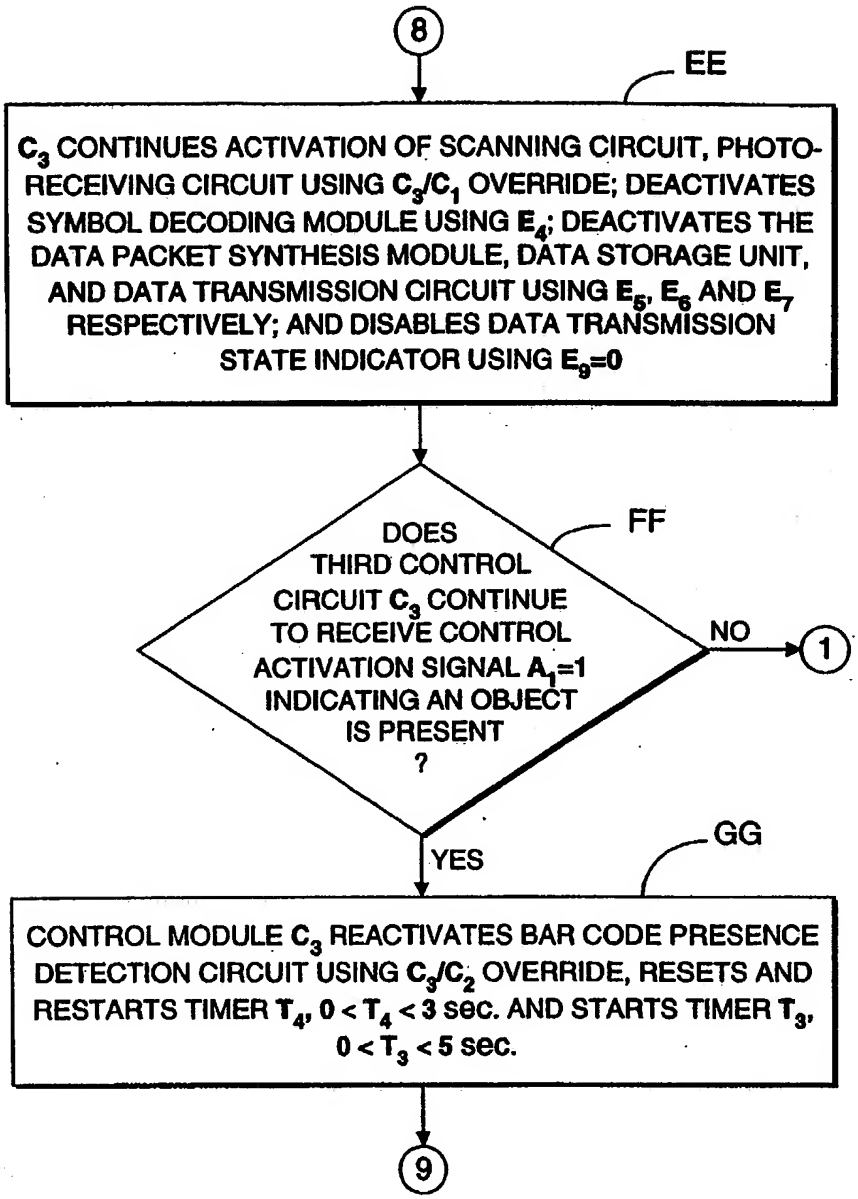

8
EE
C_3 CONTINUES ACTIVATION OF SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT USING C_3/C_1 OVERRIDE; DEACTIVATES SYMBOL DECODING MODULE USING E_4; DEACTIVATES THE DATA PACKET SYNTHESIS MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT USING E_5, E_6 AND E_7 RESPECTIVELY; AND DISABLES DATA TRANSMISSION STATE INDICATOR USING E_9=0
FF
DOES THIRD CONTROL CIRCUIT C_3 CONTINUE TO RECEIVE CONTROL ACTIVATION SIGNAL A_1=1 INDICATING AN OBJECT IS PRESENT ?
NO
1
YES
GG
CONTROL MODULE C_3 REACTIVATES BAR CODE PRESENCE DETECTION CIRCUIT USING C_3/C_2 OVERRIDE, RESETS AND RESTARTS TIMER T_4, $0 < T_4 < 3$ sec. AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
9

FIG. 23E

751161

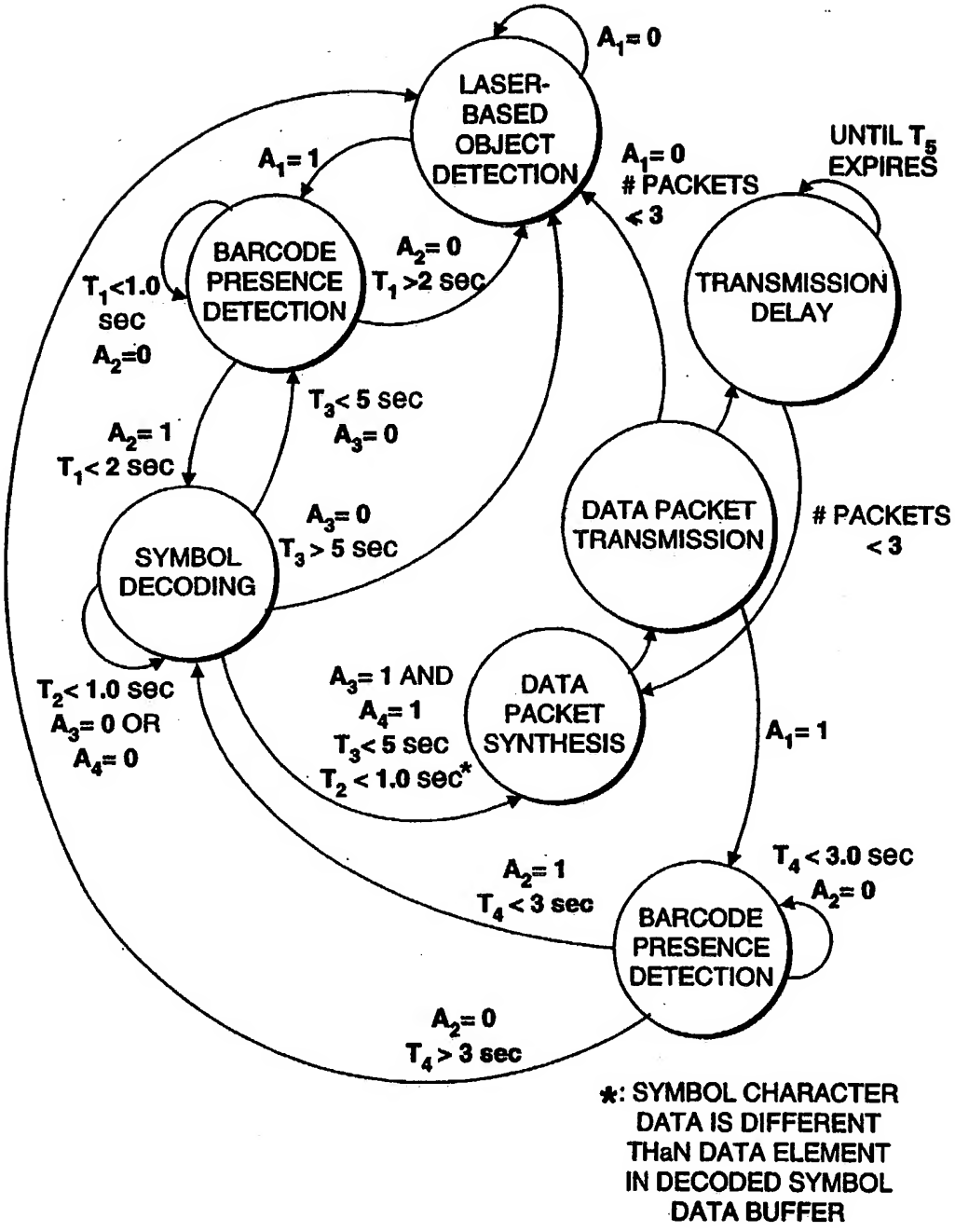


FIG. 24

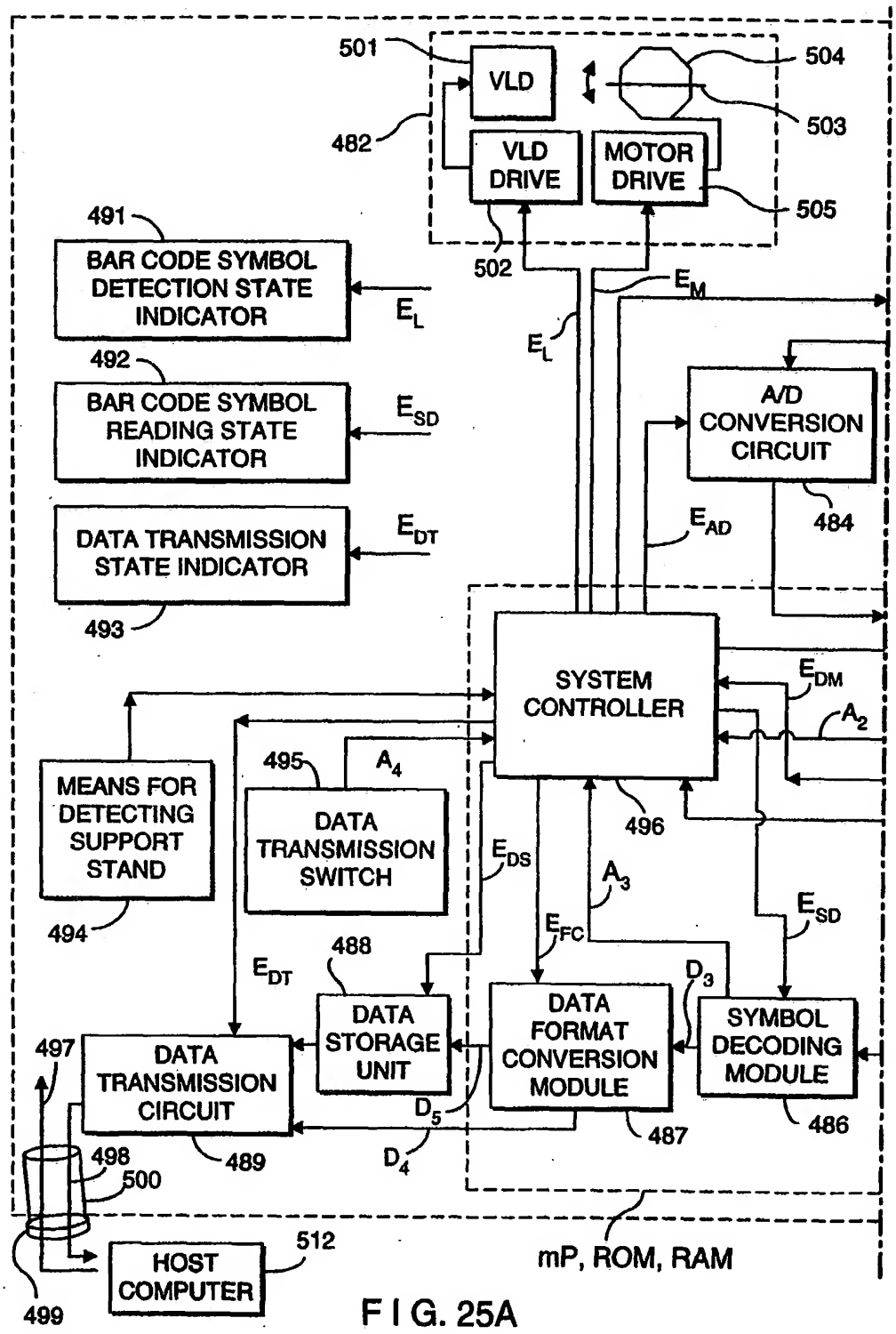

501
VLD
504
503
482
VLD DRIVE
MOTOR DRIVE
505
502
491
BAR CODE SYMBOL DETECTION STATE INDICATOR
E_L
E_M
E_L
492
BAR CODE SYMBOL READING STATE INDICATOR
E_{SD}
A/D CONVERSION CIRCUIT
DATA TRANSMISSION STATE INDICATOR
E_{DT}
E_{AD}
484
493
SYSTEM CONTROLLER
E_{DM}
A_2
MEANS FOR DETECTING SUPPORT STAND
495
A_4
DATA TRANSMISSION SWITCH
496
E_{DS}
A_3
E_{SD}
494
E_{FC}
488
E_{DT}
D_3
DATA STORAGE UNIT
DATA FORMAT CONVERSION MODULE
SYMBOL DECODING MODULE
497
DATA TRANSMISSION CIRCUIT
D_5
487
486
498
500
489
D_4
512
HOST COMPUTER
mP, ROM, RAM
499

FIG. 25A

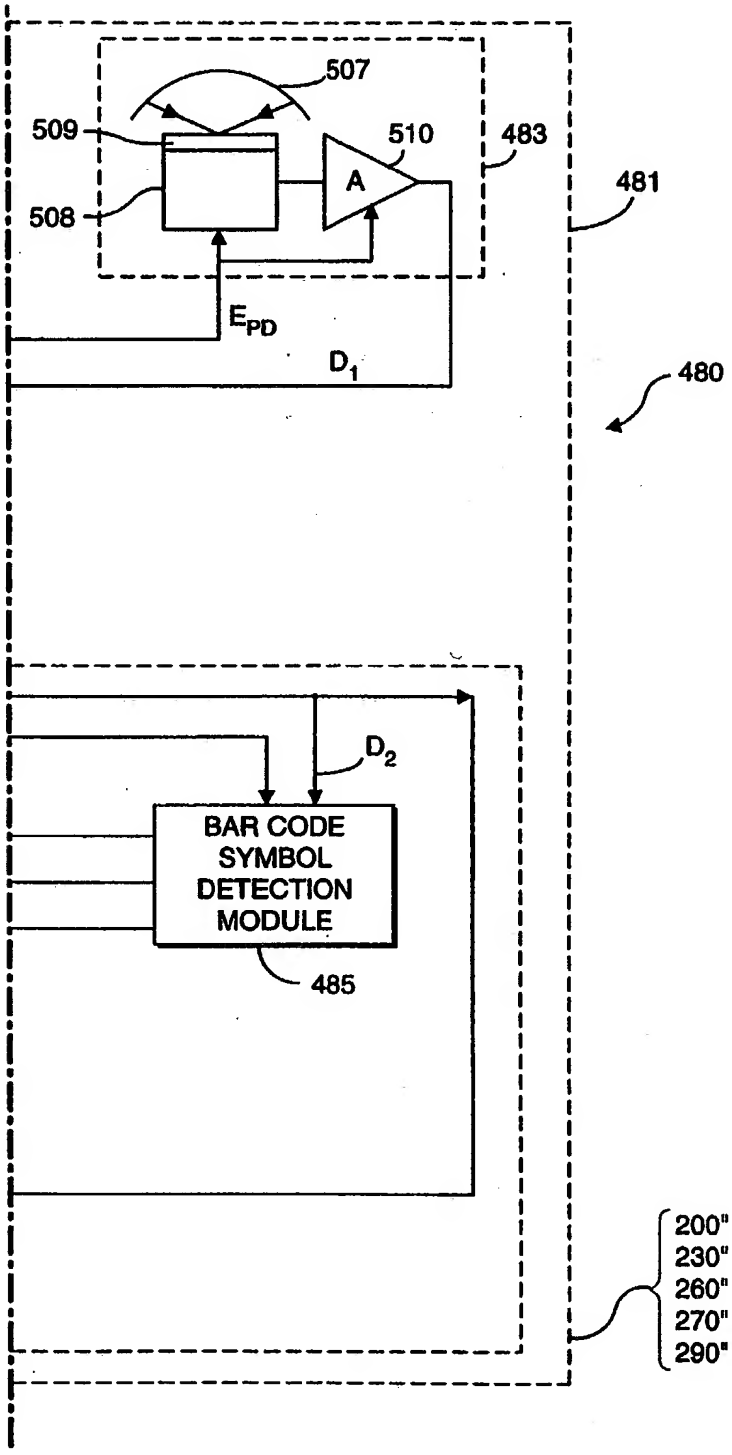

507
509
510
483
A
508
481
E_{PD}
D_1
480
D_2
BAR CODE SYMBOL DETECTION MODULE
485
200"
230"
260"
270"
290"

FIG. 25B

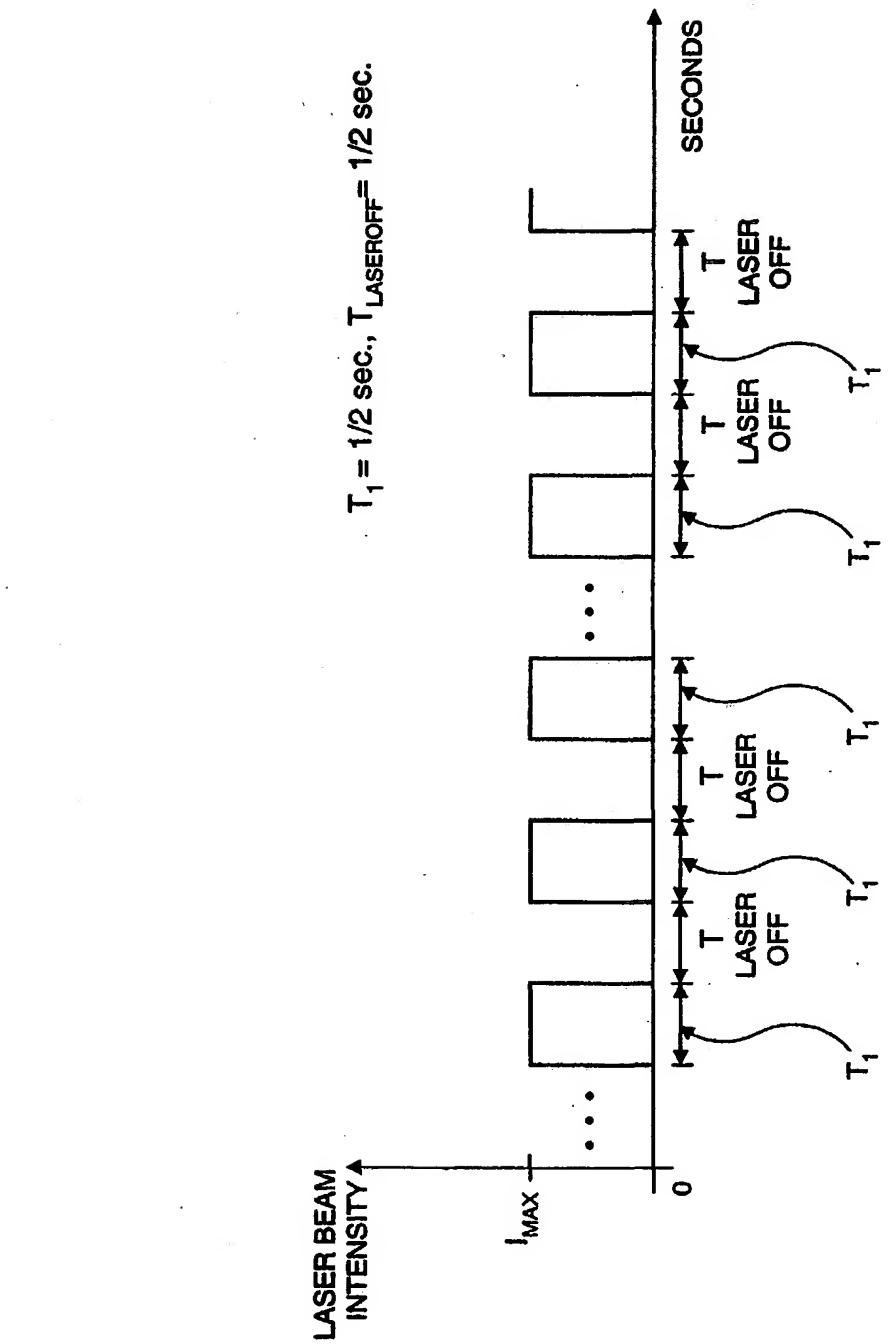

LASER BEAM INTENSITY
I_{MAX}
0
SECONDS
T_1 = 1/2 sec., $T_{LASEROFF}$ = 1/2 sec.
T LASER OFF
T_1

FIG. 26

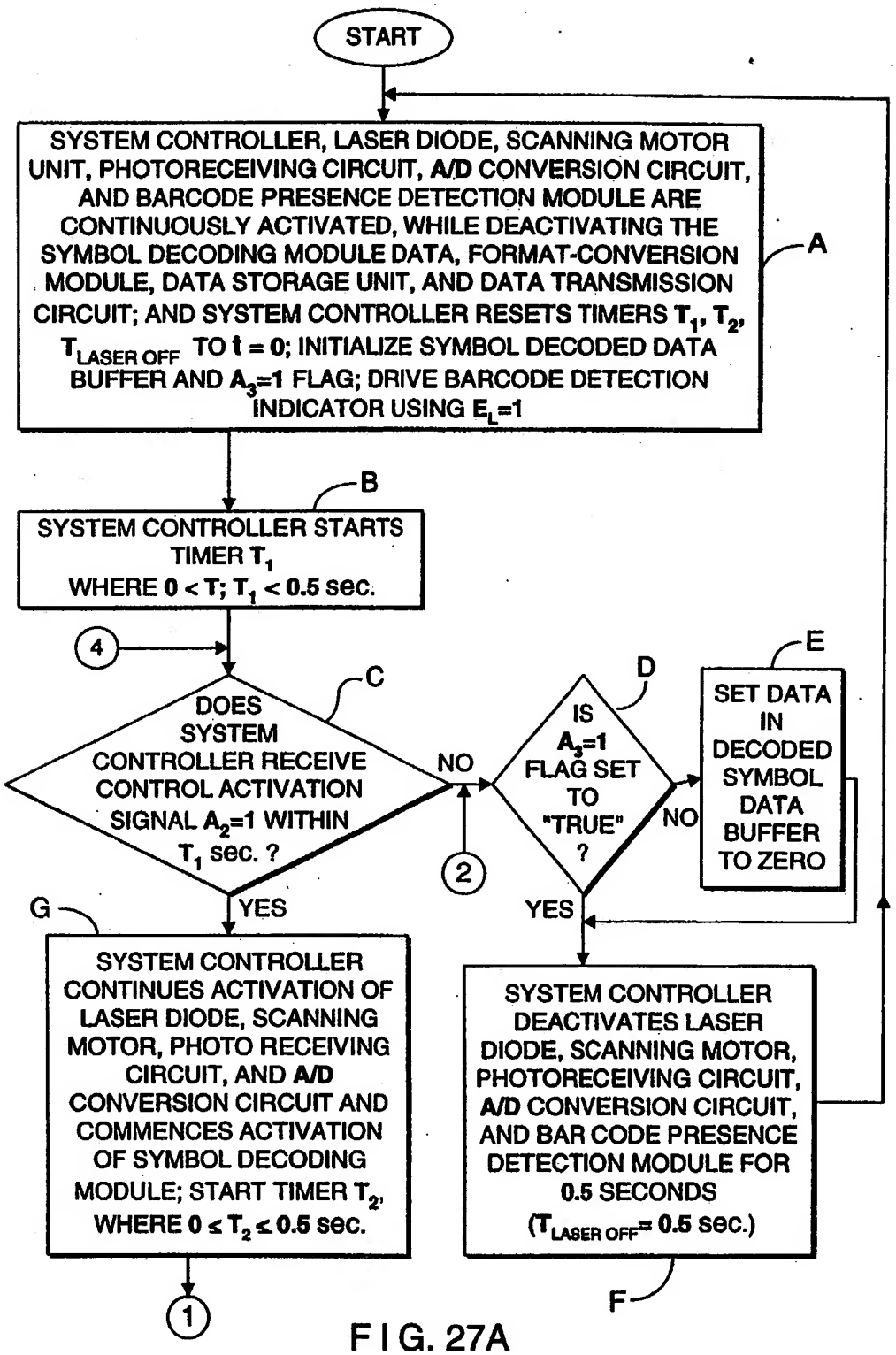

START
SYSTEM CONTROLLER, LASER DIODE, SCANNING MOTOR UNIT, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT, AND BARCODE PRESENCE DETECTION MODULE ARE CONTINUOUSLY ACTIVATED, WHILE DEACTIVATING THE SYMBOL DECODING MODULE DATA, FORMAT-CONVERSION MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT; AND SYSTEM CONTROLLER RESETS TIMERS T_1, T_2, $T_{LASER\ OFF}$ TO t = 0; INITIALIZE SYMBOL DECODED DATA BUFFER AND A_3=1 FLAG; DRIVE BARCODE DETECTION INDICATOR USING E_L=1
A
B
SYSTEM CONTROLLER STARTS TIMER T_1 WHERE 0 < T; T_1 < 0.5 sec.
4
C
DOES SYSTEM CONTROLLER RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 WITHIN T_1 sec. ?
NO
YES
D
IS A_3=1 FLAG SET TO "TRUE" ?
NO
YES
E
SET DATA IN DECODED SYMBOL DATA BUFFER TO ZERO
2
G
SYSTEM CONTROLLER CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTO RECEIVING CIRCUIT, AND A/D CONVERSION CIRCUIT AND COMMENCES ACTIVATION OF SYMBOL DECODING MODULE; START TIMER T_2, WHERE 0 ≤ T_2 ≤ 0.5 sec.
SYSTEM CONTROLLER DEACTIVATES LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT, AND BAR CODE PRESENCE DETECTION MODULE FOR 0.5 SECONDS ($T_{LASER\ OFF}$= 0.5 sec.)
F
1

FIG. 27A

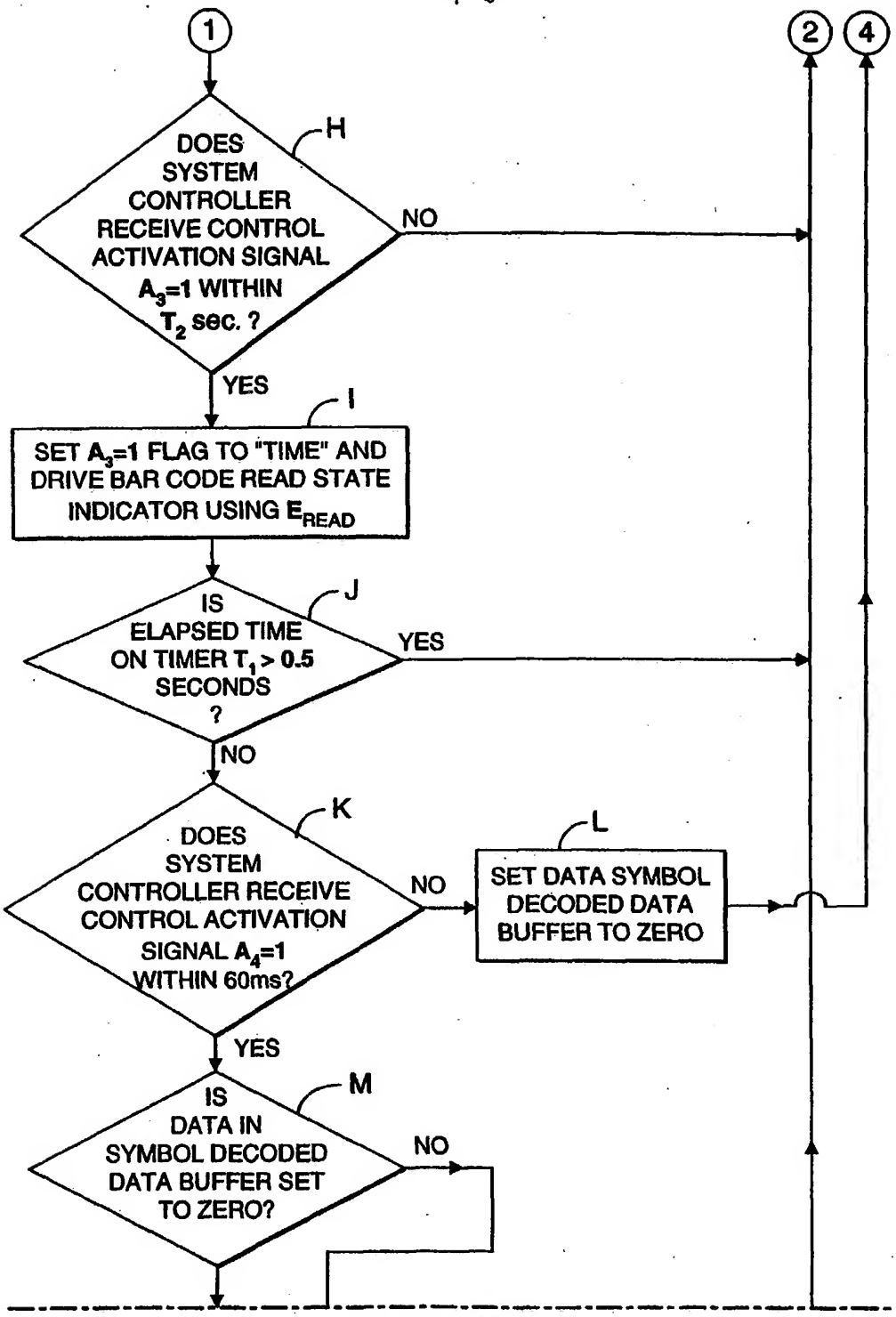

1
2
4
H
DOES SYSTEM CONTROLLER RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 sec. ?
NO
YES
I
SET A_3=1 FLAG TO "TIME" AND DRIVE BAR CODE READ STATE INDICATOR USING E_{READ}
J
IS ELAPSED TIME ON TIMER T_1 > 0.5 SECONDS ?
YES
NO
K
DOES SYSTEM CONTROLLER RECEIVE CONTROL ACTIVATION SIGNAL A_4=1 WITHIN 60ms?
NO
L
SET DATA SYMBOL DECODED DATA BUFFER TO ZERO
YES
M
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
NO

FIG. 27B1

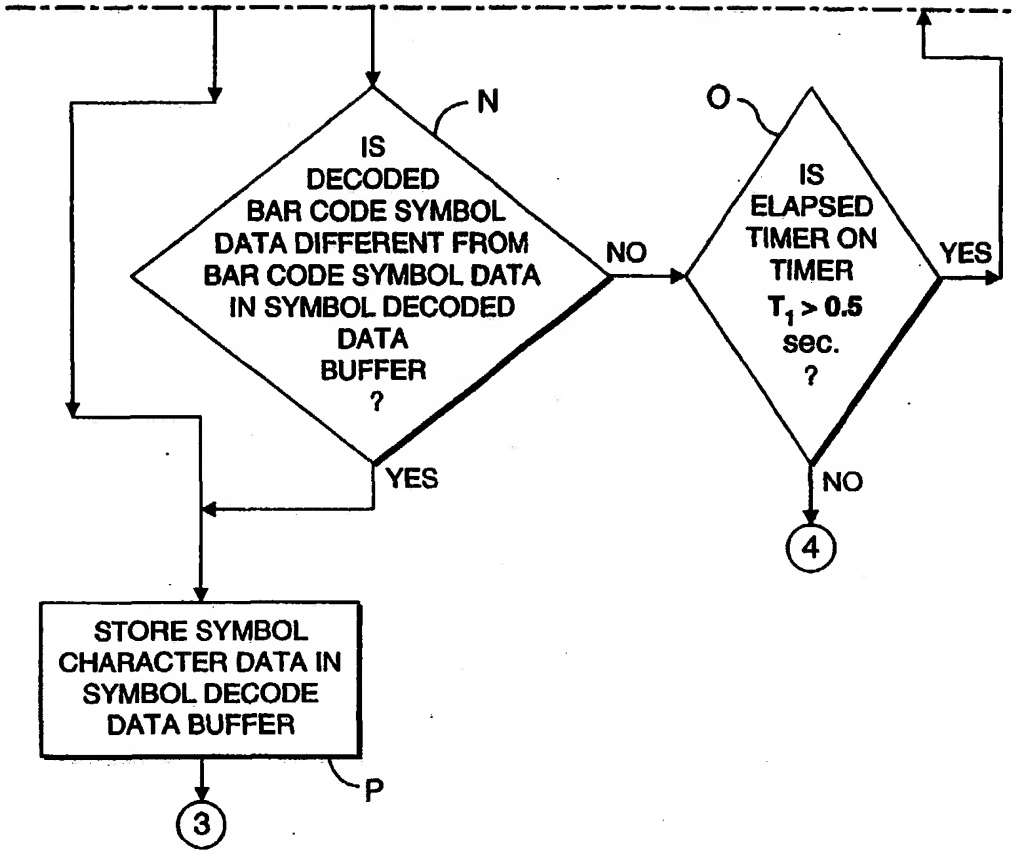

N
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
NO
O
IS ELAPSED TIMER ON TIMER $T_1 > 0.5$ sec. ?
YES
NO
4
YES
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER
P
3

FIG. 27B2

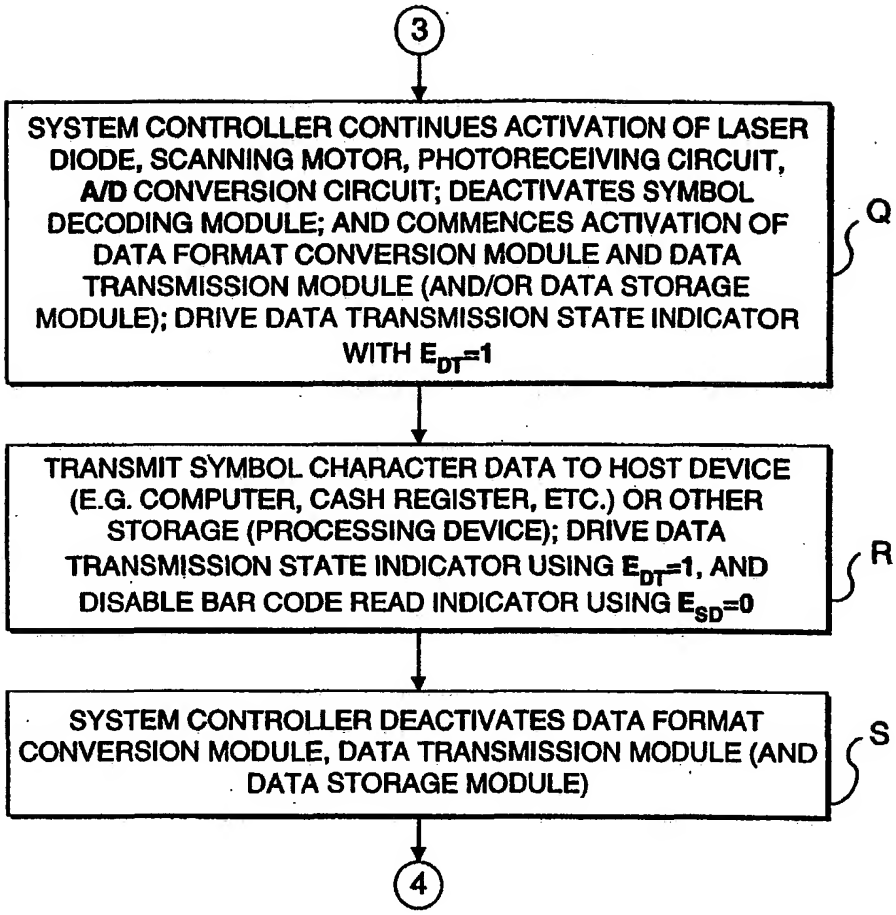

3
SYSTEM CONTROLLER CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION OF DATA FORMAT CONVERSION MODULE AND DATA TRANSMISSION MODULE (AND/OR DATA STORAGE MODULE); DRIVE DATA TRANSMISSION STATE INDICATOR WITH E_{DT}=1
Q
TRANSMIT SYMBOL CHARACTER DATA TO HOST DEVICE (E.G. COMPUTER, CASH REGISTER, ETC.) OR OTHER STORAGE (PROCESSING DEVICE); DRIVE DATA TRANSMISSION STATE INDICATOR USING E_{DT}=1, AND DISABLE BAR CODE READ INDICATOR USING E_{SD}=0
R
SYSTEM CONTROLLER DEACTIVATES DATA FORMAT CONVERSION MODULE, DATA TRANSMISSION MODULE (AND DATA STORAGE MODULE)
S
4

FIG. 27C

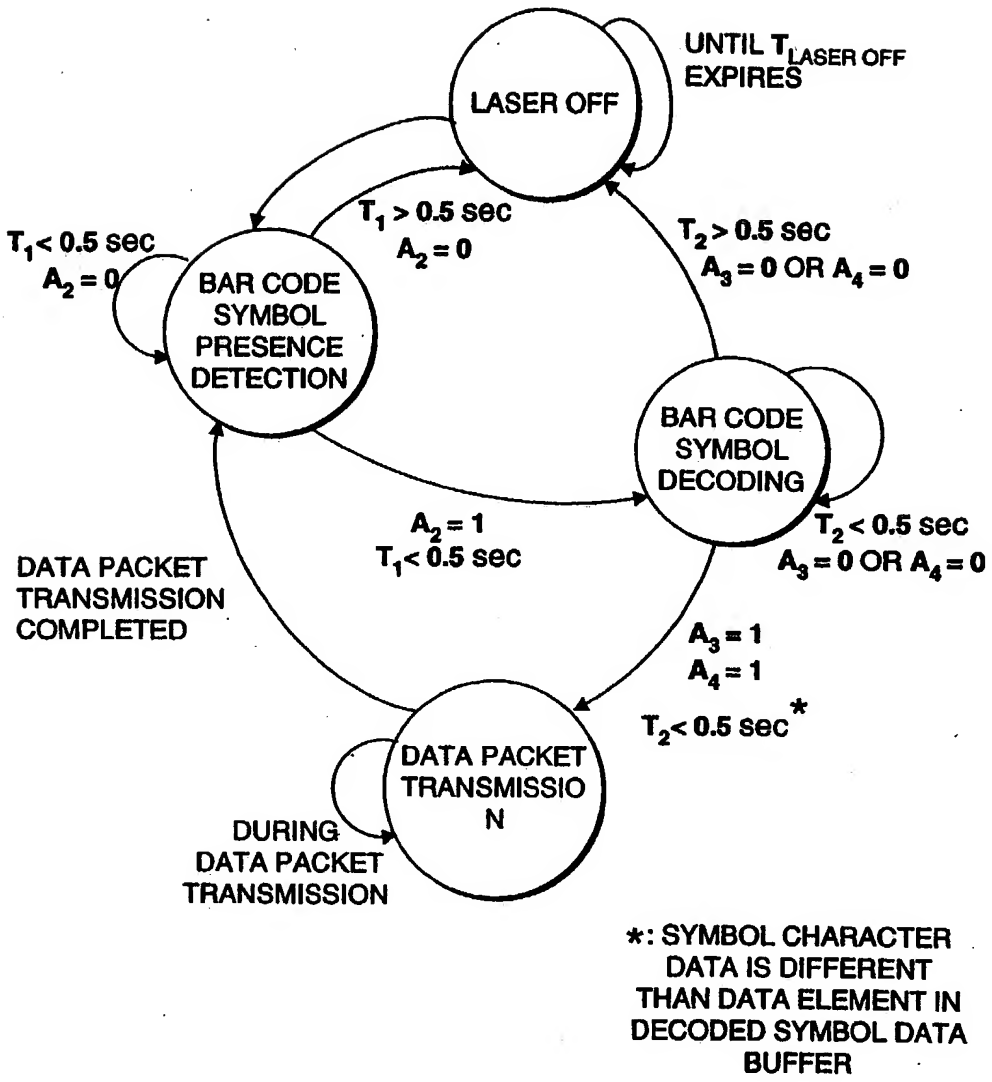

LASER OFF
UNTIL $T_{LASER\ OFF}$ EXPIRES
BAR CODE SYMBOL PRESENCE DETECTION
$T_1 < 0.5$ sec
$A_2 = 0$
$T_1 > 0.5$ sec
$A_2 = 0$
$T_2 > 0.5$ sec
$A_3 = 0$ OR $A_4 = 0$
BAR CODE SYMBOL DECODING
$T_2 < 0.5$ sec
$A_3 = 0$ OR $A_4 = 0$
$A_2 = 1$
$T_1 < 0.5$ sec
DATA PACKET TRANSMISSION COMPLETED
$A_3 = 1$
$A_4 = 1$
$T_2 < 0.5$ sec*
DATA PACKET TRANSMISSIO N
DURING DATA PACKET TRANSMISSION
*: SYMBOL CHARACTER DATA IS DIFFERENT THAN DATA ELEMENT IN DECODED SYMBOL DATA BUFFER

FIG. 28

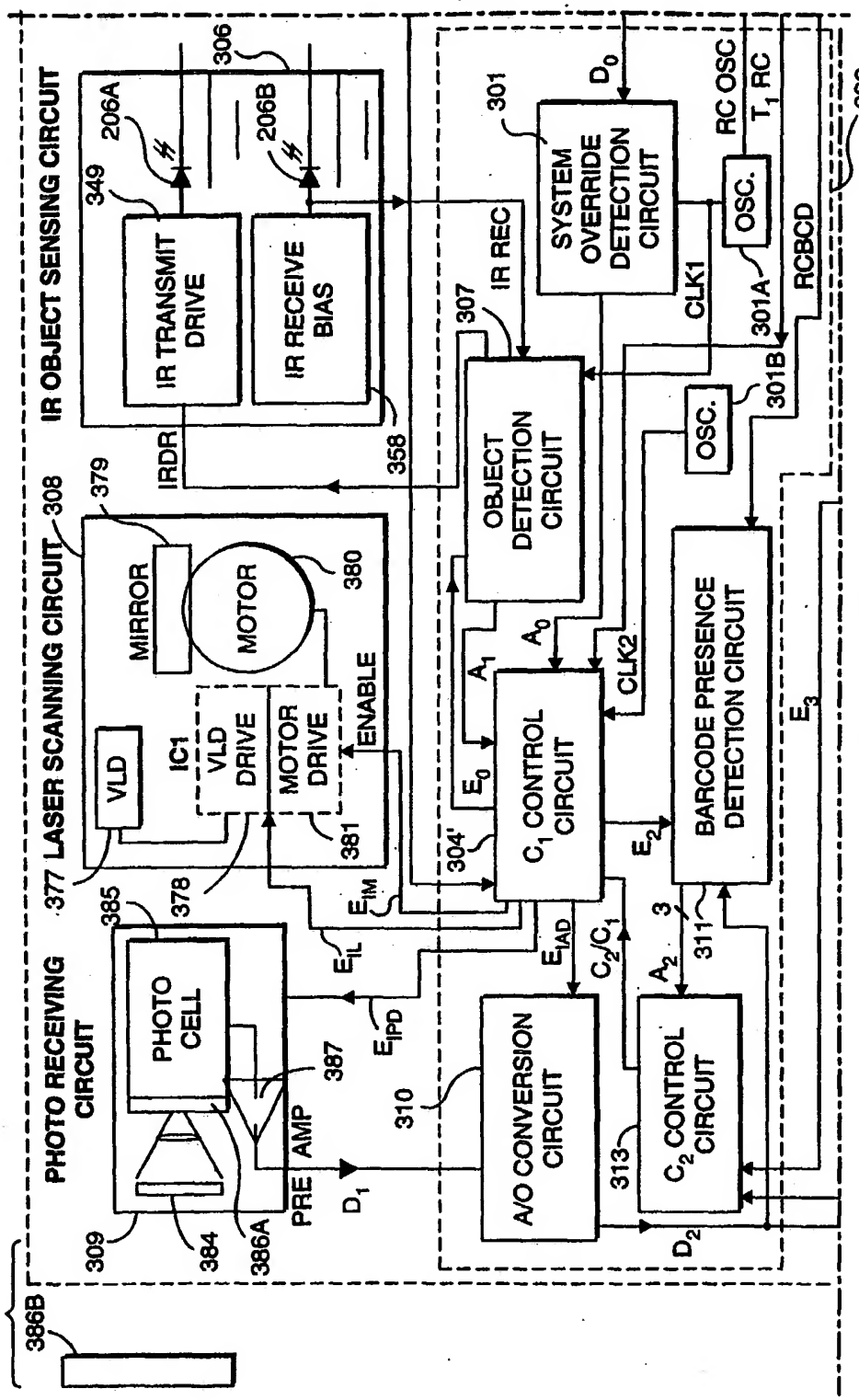

IR OBJECT SENSING CIRCUIT
LASER SCANNING CIRCUIT
PHOTO RECEIVING CIRCUIT
IR TRANSMIT DRIVE
IR RECEIVE BIAS
IR REC
SYSTEM OVERRIDE DETECTION CIRCUIT
OBJECT DETECTION CIRCUIT
MIRROR
MOTOR
VLD
IC1
VLD DRIVE
MOTOR DRIVE
ENABLE
PHOTO CELL
PRE AMP
A/O CONVERSION CIRCUIT
C1 CONTROL CIRCUIT
C2 CONTROL CIRCUIT
BARCODE PRESENCE DETECTION CIRCUIT
OSC.
RC OSC
RCBCD
CLK1
CLK2
IRDR
306
206A
206B
349
358
307
301
301A
301B
333
308
379
380
381
377
378
385
387
309
384
386A
386B
310
311
313
304'
D0
D1
D2
A0
A1
A2
E0
E2
E3
EIM
EIL
EIPD
EIAD
C2/C1
T1 RC

FIG. 29A1

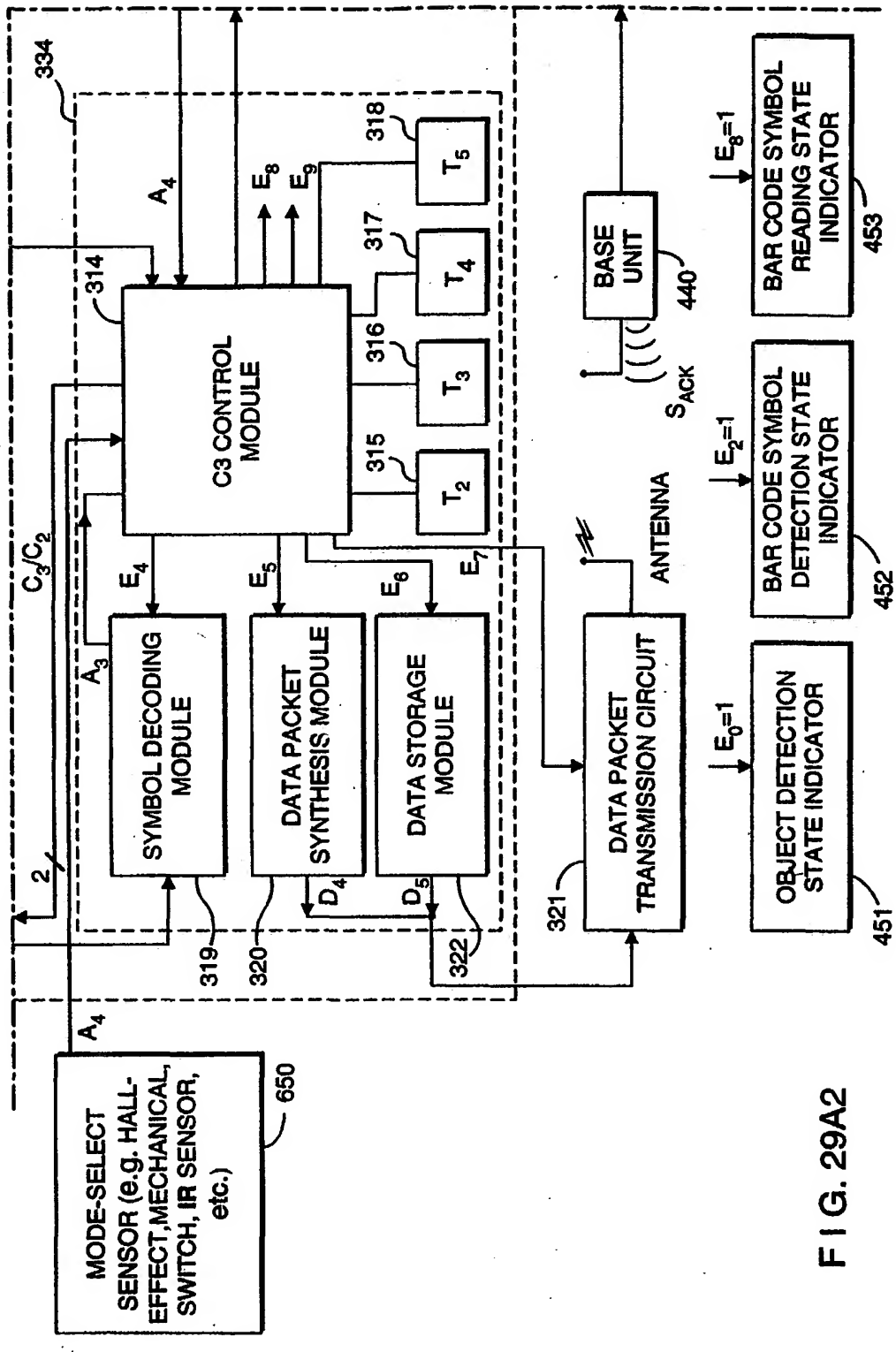

334
314
C3 CONTROL MODULE
A_4
E_8
E_9
318
317
316
315
T_5
T_4
T_3
T_2
BASE UNIT
440
S_{ACK}
ANTENNA
C_3/C_2
2
A_3
E_4
E_5
E_6
E_7
SYMBOL DECODING MODULE
DATA PACKET SYNTHESIS MODULE
DATA STORAGE MODULE
DATA PACKET TRANSMISSION CIRCUIT
321
319
320
322
D_4
D_5
A_4
MODE-SELECT SENSOR (e.g. HALL-EFFECT, MECHANICAL, SWITCH, IR SENSOR, etc.)
650
E_0=1
E_2=1
E_8=1
OBJECT DETECTION STATE INDICATOR
BAR CODE SYMBOL DETECTION STATE INDICATOR
BAR CODE SYMBOL READING STATE INDICATOR
451
452
453

FIG. 29A2

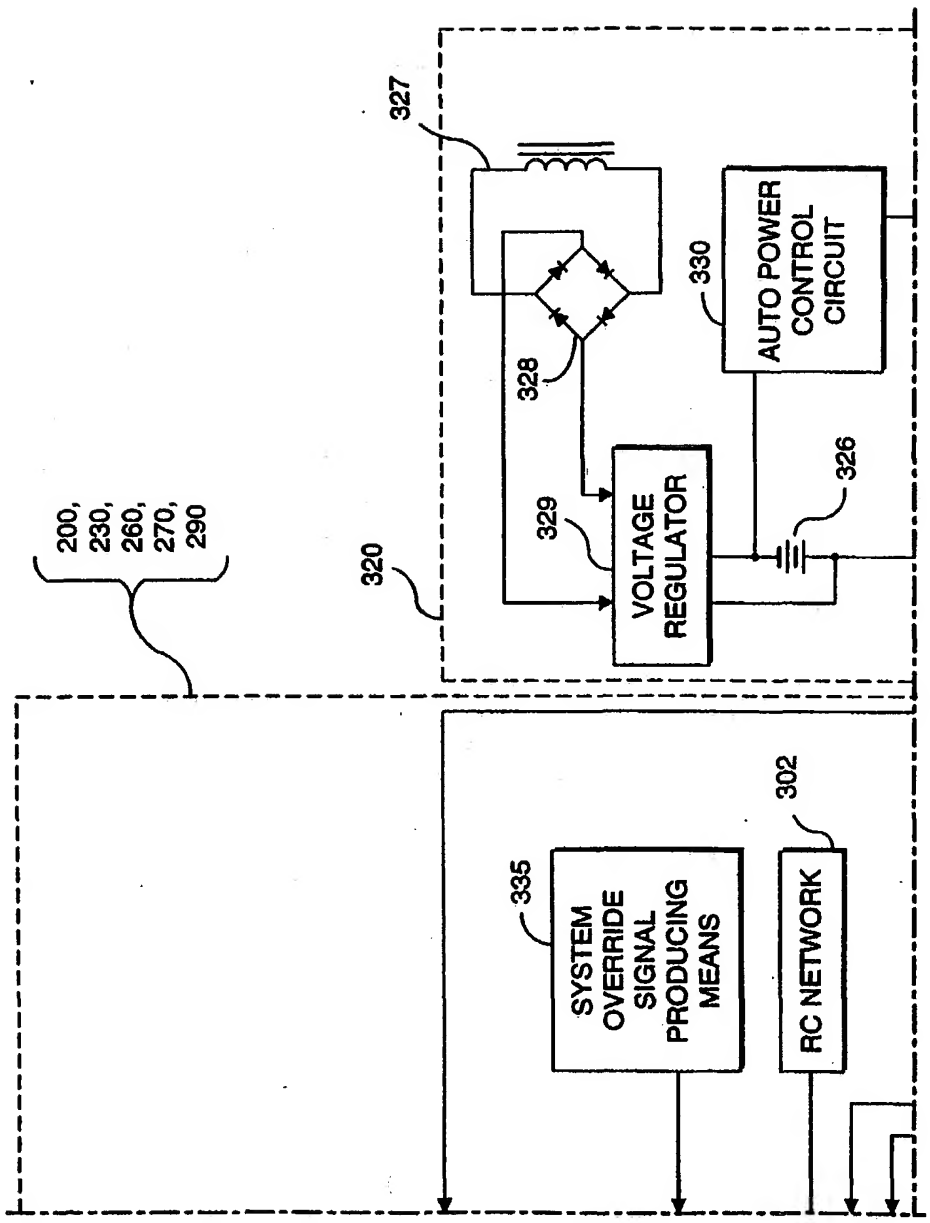

200, 230, 260, 270, 290
320
327
328
329
326
330
AUTO POWER CONTROL CIRCUIT
VOLTAGE REGULATOR
335
SYSTEM OVERRIDE SIGNAL PRODUCING MEANS
302
RC NETWORK

FIG. 29A3

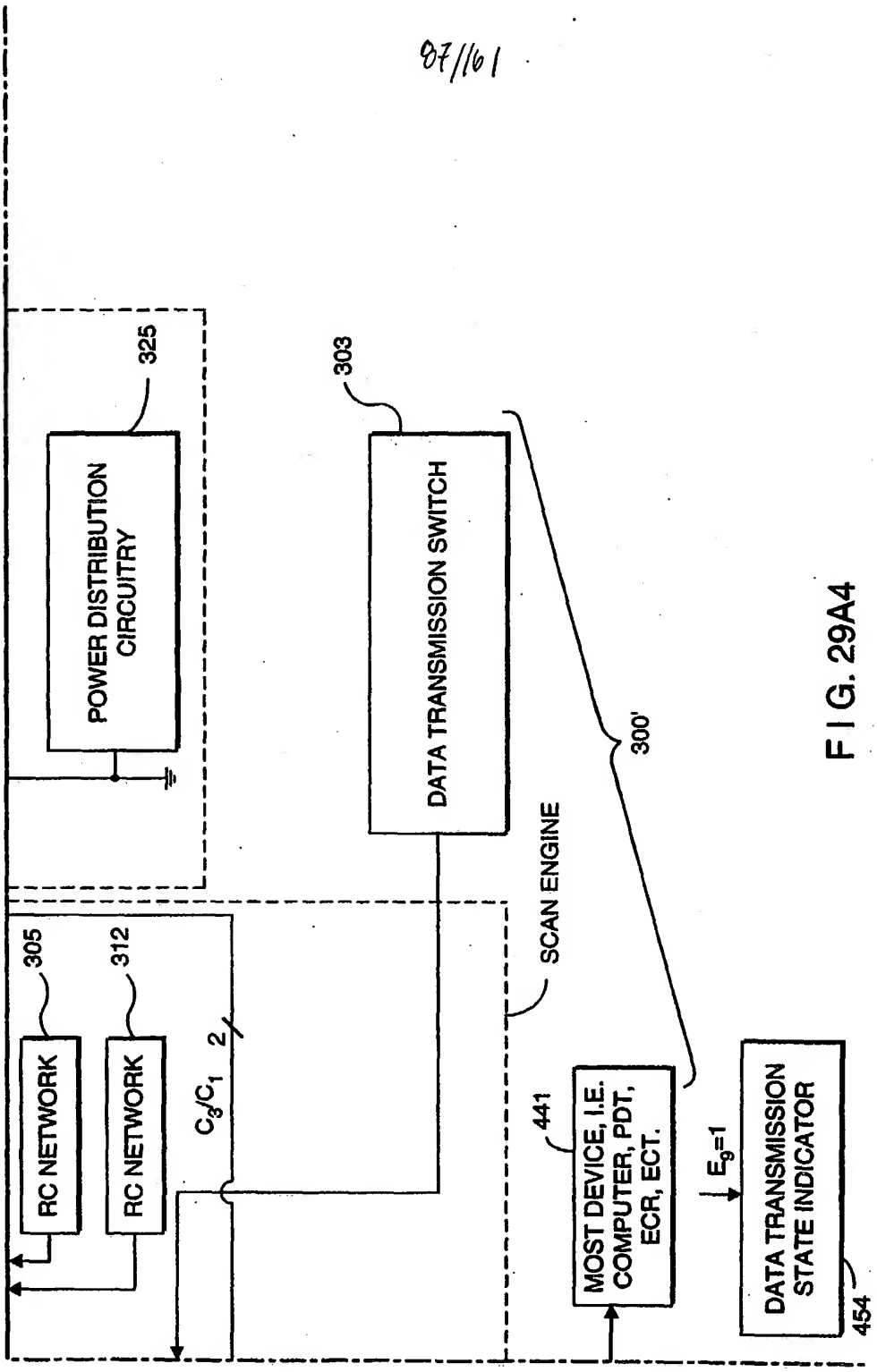

POWER DISTRIBUTION CIRCUITRY
325
303
DATA TRANSMISSION SWITCH
300'
SCAN ENGINE
305
RC NETWORK
312
RC NETWORK
C_3/C_1 2
441
MOST DEVICE, I.E. COMPUTER, PDT, ECR, ECT.
E_g=1
DATA TRANSMISSION STATE INDICATOR
454

FIG. 29A4

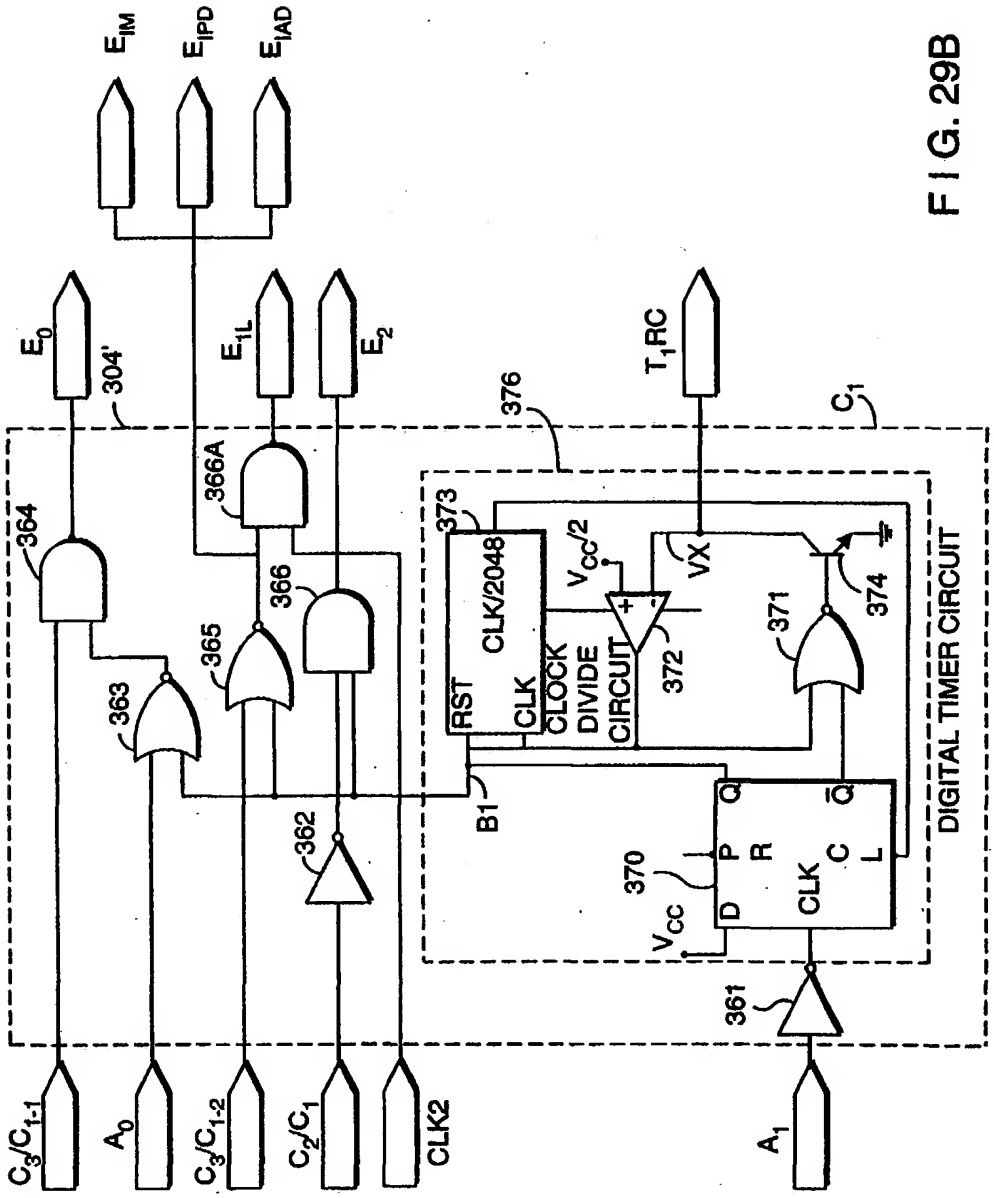

E_IM
E_IPD
E_IAD
E_0
304'
E_1L
E_2
T_1RC
376
C_1
366A
364
373
CLK/2048
RST
CLK
CLOCK DIVIDE CIRCUIT
V_CC/2
VX
372
371
374
366
365
363
B1
362
Q
Q̄
P
R
C
L
CLK
D
370
V_CC
361
DIGITAL TIMER CIRCUIT
C_3/C_1-1
A_0
C_3/C_1-2
C_2/C_1
CLK2
A_1

FIG. 29B

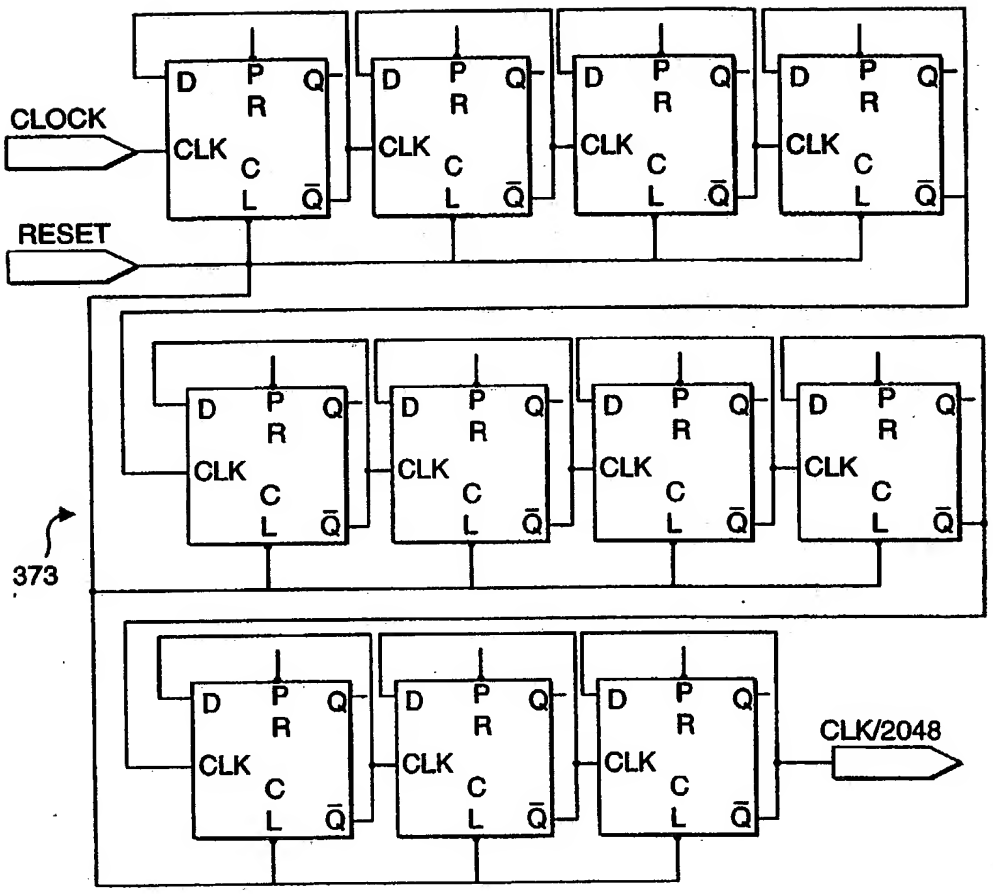


FIG. 29C

$$
\begin{cases}
E_0 = \overline{(B1 + A_0)(C_3 / C_{1-1})} \\
E_{IM} = E_{IPD} = E_{IAD} = \overline{(C_3 / C_{1-2}) + B1} \\
E_L = [\overline{(C_3 / C_{1-1}) + B1}][B2] \\
E_2 = \overline{(C_2 / C_1)}\,(B1)
\end{cases}
$$

FIG. 29D

91/161

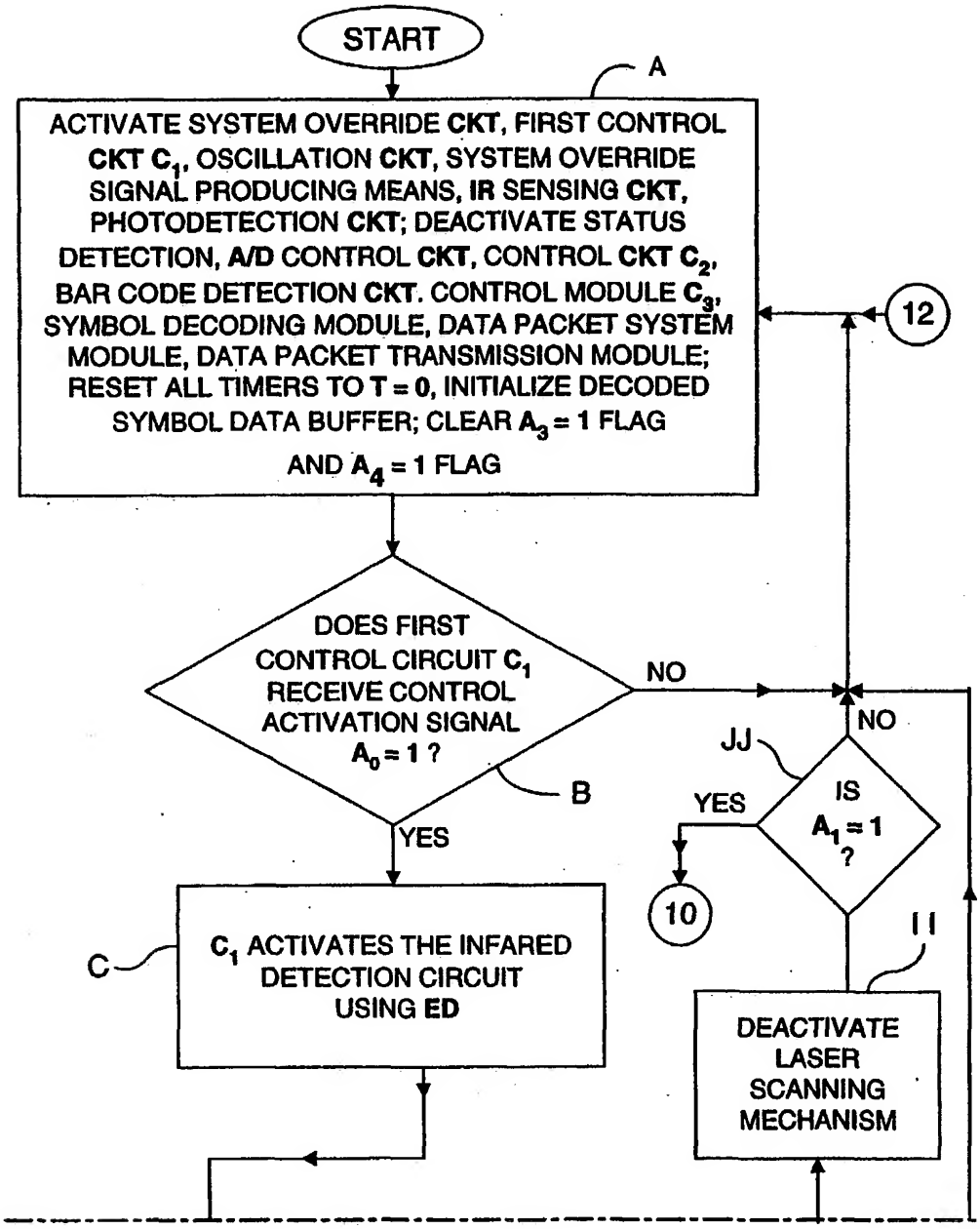


FIG. 30A1

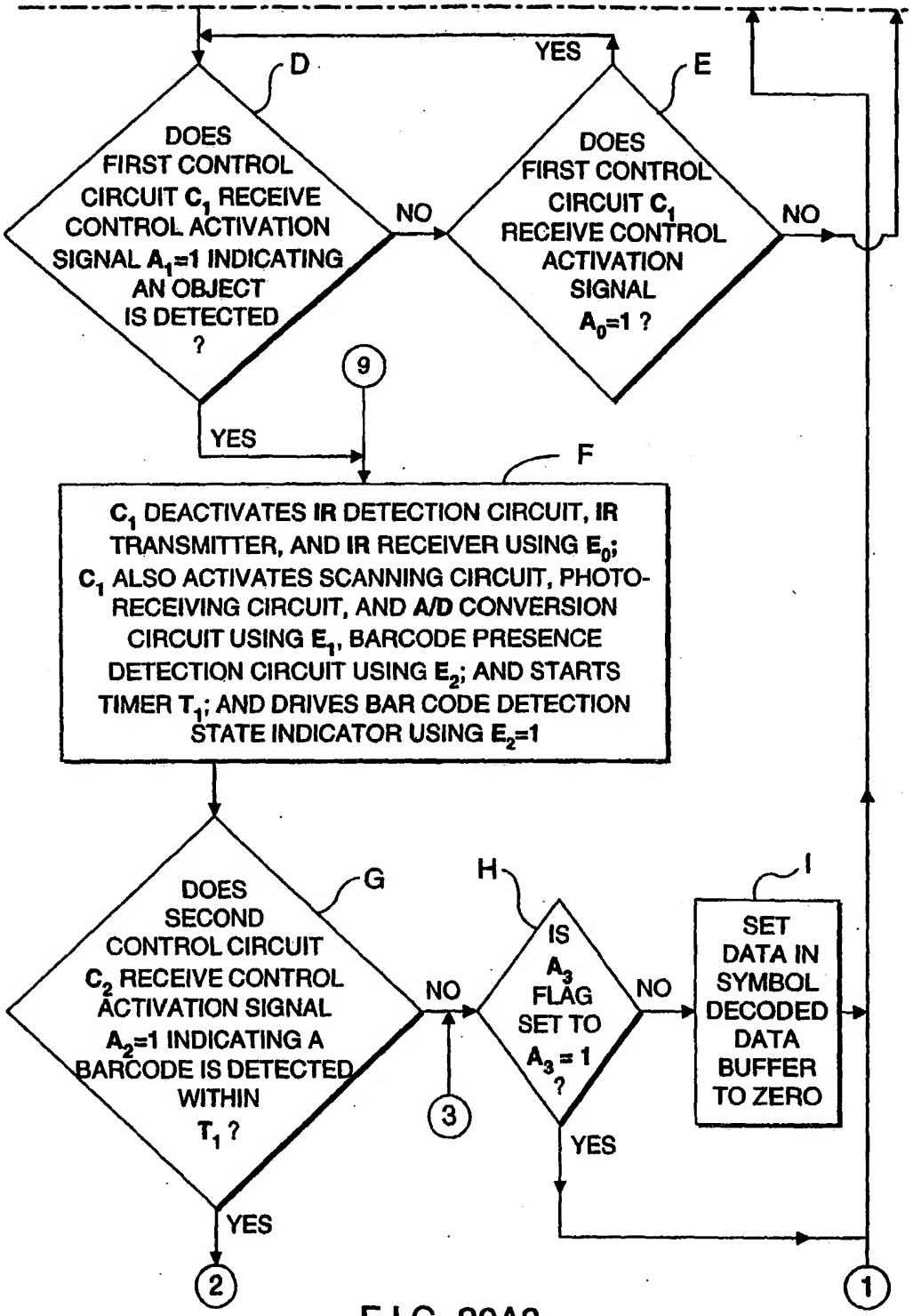

D
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_1=1 INDICATING AN OBJECT IS DETECTED ?
NO
YES
E
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0=1 ?
NO
YES
9
F
C_1 DEACTIVATES IR DETECTION CIRCUIT, IR TRANSMITTER, AND IR RECEIVER USING E_0; C_1 ALSO ACTIVATES SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT, AND A/D CONVERSION CIRCUIT USING E_1, BARCODE PRESENCE DETECTION CIRCUIT USING E_2; AND STARTS TIMER T_1; AND DRIVES BAR CODE DETECTION STATE INDICATOR USING E_2=1
G
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 INDICATING A BARCODE IS DETECTED WITHIN T_1 ?
NO
YES
H
IS A_3 FLAG SET TO A_3 = 1 ?
NO
YES
I
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
3
1
2

FIG. 30A2

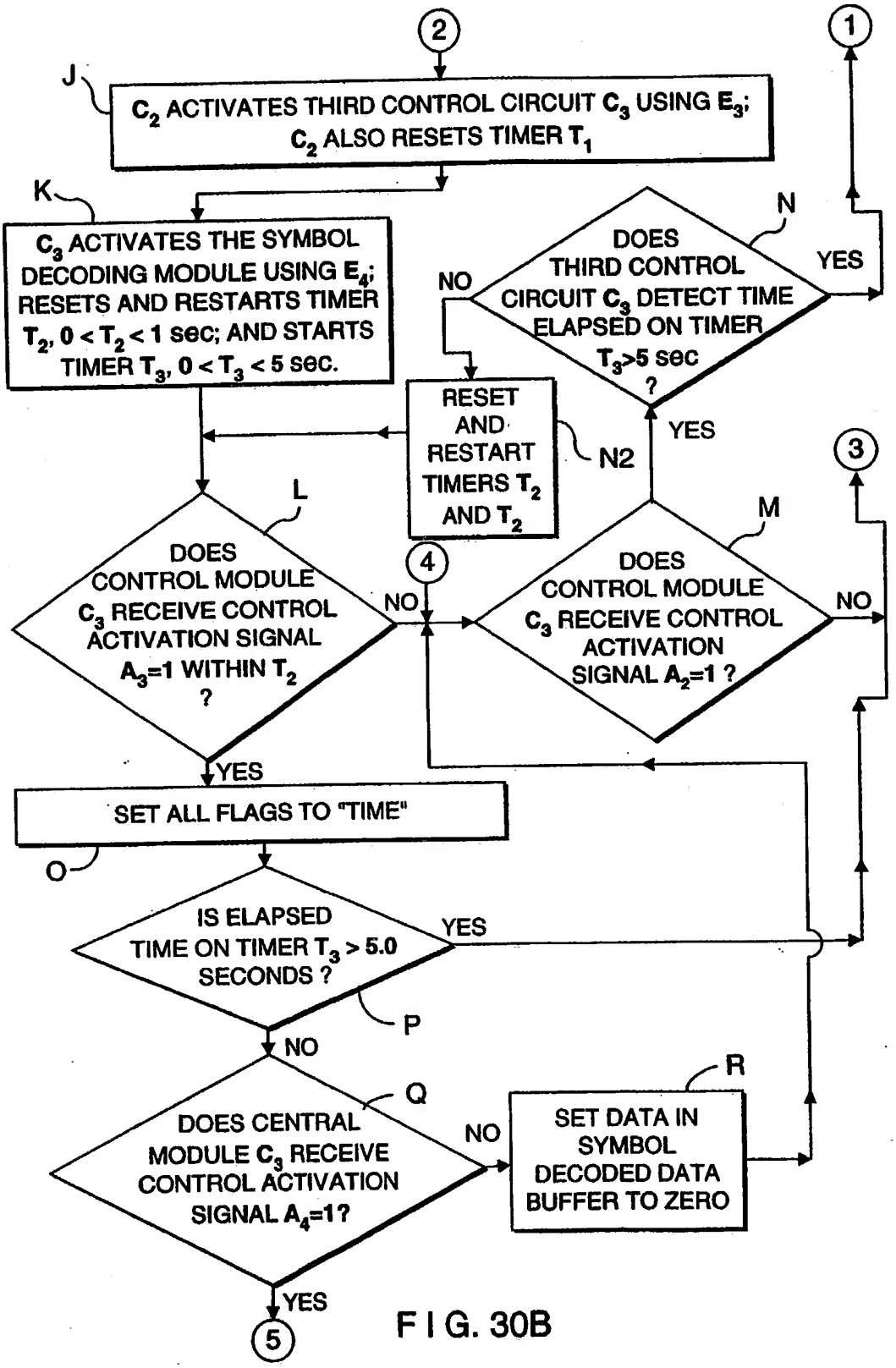

2
1
J
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3; C_2 ALSO RESETS TIMER T_1
K
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4; RESETS AND RESTARTS TIMER T_2, $0 < T_2 < 1$ sec; AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
N
DOES THIRD CONTROL CIRCUIT C_3 DETECT TIME ELAPSED ON TIMER T_3>5 sec ?
YES
NO
RESET AND RESTART TIMERS T_2 AND T_2
N2
YES
3
L
M
4
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 ?
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 ?
NO
YES
SET ALL FLAGS TO "TIME"
O
IS ELAPSED TIME ON TIMER T_3 > 5.0 SECONDS ?
YES
P
NO
R
Q
DOES CENTRAL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_4=1?
NO
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
YES
5

FIG. 30B

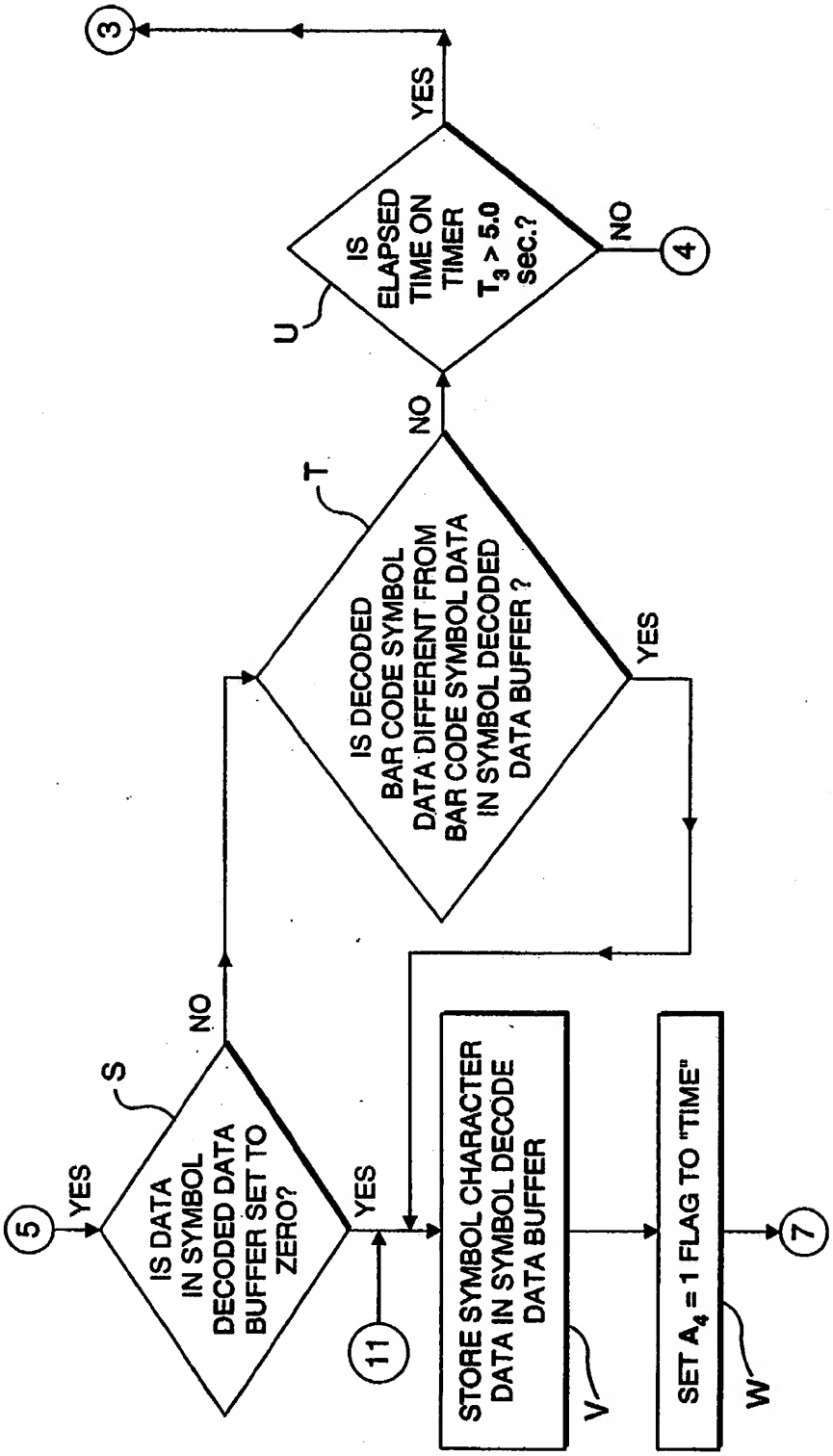

5
YES
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
S
NO
YES
11
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER
V
SET A_4 = 1 FLAG TO "TIME"
W
7
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
T
YES
NO
IS ELAPSED TIME ON TIMER $T_3 > 5.0$ sec.?
U
YES
NO
3
4

FIG. 30C

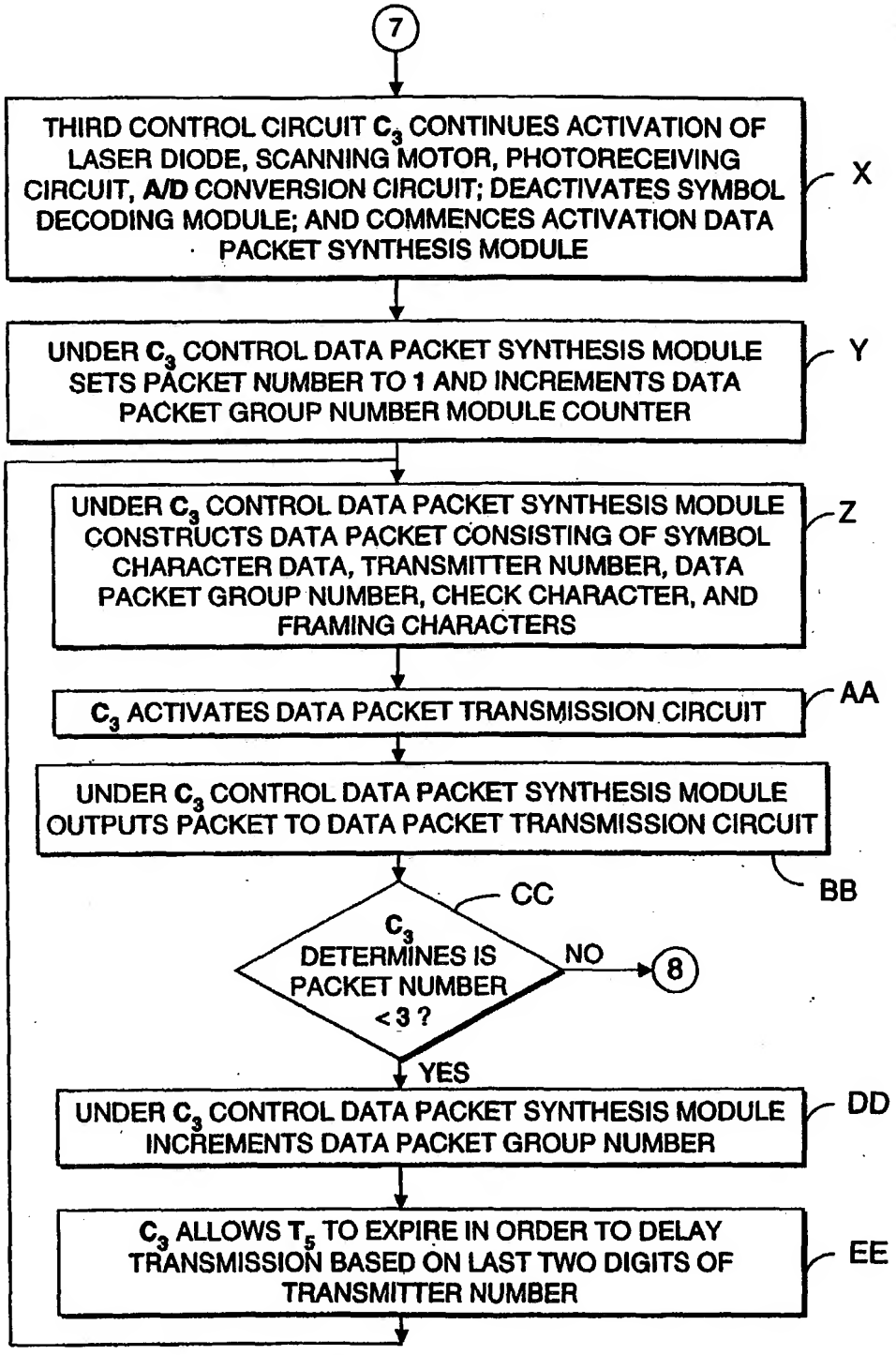

7
THIRD CONTROL CIRCUIT C_3 CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION DATA PACKET SYNTHESIS MODULE
X
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE SETS PACKET NUMBER TO 1 AND INCREMENTS DATA PACKET GROUP NUMBER MODULE COUNTER
Y
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE CONSTRUCTS DATA PACKET CONSISTING OF SYMBOL CHARACTER DATA, TRANSMITTER NUMBER, DATA PACKET GROUP NUMBER, CHECK CHARACTER, AND FRAMING CHARACTERS
Z
C_3 ACTIVATES DATA PACKET TRANSMISSION CIRCUIT
AA
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE OUTPUTS PACKET TO DATA PACKET TRANSMISSION CIRCUIT
BB
CC
C_3 DETERMINES IS PACKET NUMBER < 3 ?
NO
8
YES
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE INCREMENTS DATA PACKET GROUP NUMBER
DD
C_3 ALLOWS T_5 TO EXPIRE IN ORDER TO DELAY TRANSMISSION BASED ON LAST TWO DIGITS OF TRANSMITTER NUMBER
EE

FIG. 30D

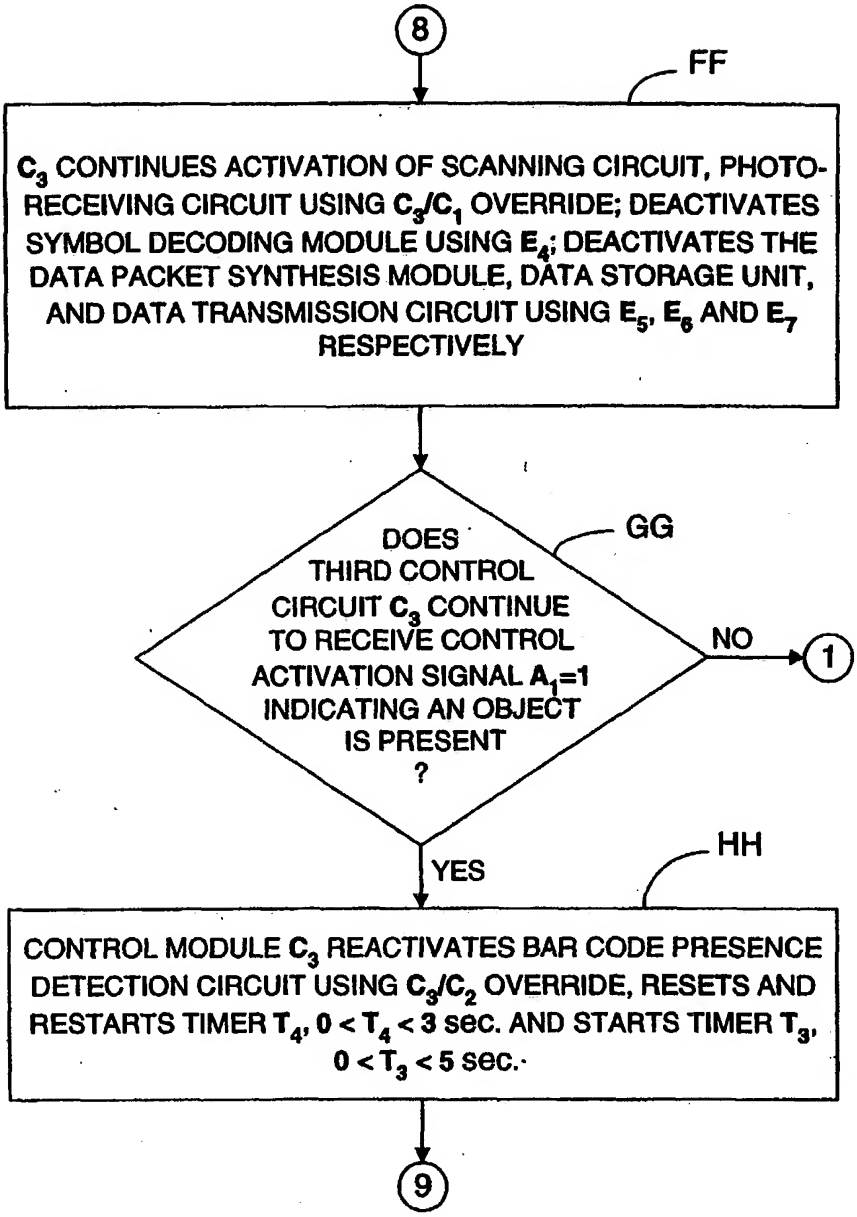

8
FF
C3 CONTINUES ACTIVATION OF SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT USING C3/C1 OVERRIDE; DEACTIVATES SYMBOL DECODING MODULE USING E4; DEACTIVATES THE DATA PACKET SYNTHESIS MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT USING E5, E6 AND E7 RESPECTIVELY
GG
DOES THIRD CONTROL CIRCUIT C3 CONTINUE TO RECEIVE CONTROL ACTIVATION SIGNAL A1=1 INDICATING AN OBJECT IS PRESENT ?
NO
1
YES
HH
CONTROL MODULE C3 REACTIVATES BAR CODE PRESENCE DETECTION CIRCUIT USING C3/C2 OVERRIDE, RESETS AND RESTARTS TIMER T4, 0 < T4 < 3 sec. AND STARTS TIMER T3, 0 < T3 < 5 sec.
9

FIG. 30E

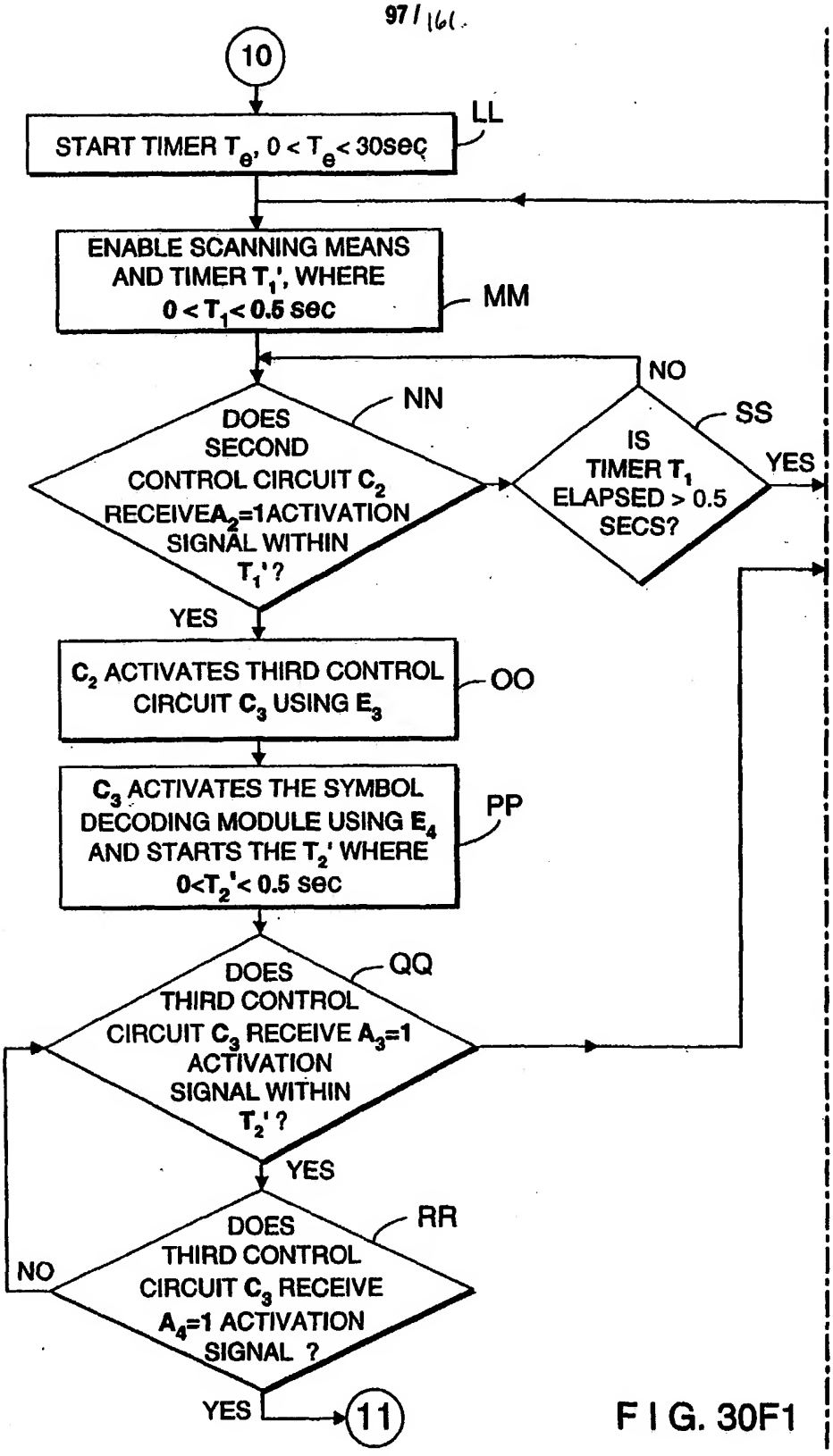

10
START TIMER T_e, $0 < T_e < 30$sec
LL
ENABLE SCANNING MEANS AND TIMER T_1', WHERE $0 < T_1 < 0.5$ sec
MM
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE A_2=1 ACTIVATION SIGNAL WITHIN T_1'?
NN
NO
IS TIMER T_1 ELAPSED > 0.5 SECS?
SS
YES
YES
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3
OO
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4 AND STARTS THE T_2' WHERE $0 < T_2' < 0.5$ sec
PP
DOES THIRD CONTROL CIRCUIT C_3 RECEIVE A_3=1 ACTIVATION SIGNAL WITHIN T_2'?
QQ
YES
DOES THIRD CONTROL CIRCUIT C_3 RECEIVE A_4=1 ACTIVATION SIGNAL ?
RR
NO
YES
11

FIG. 30F1

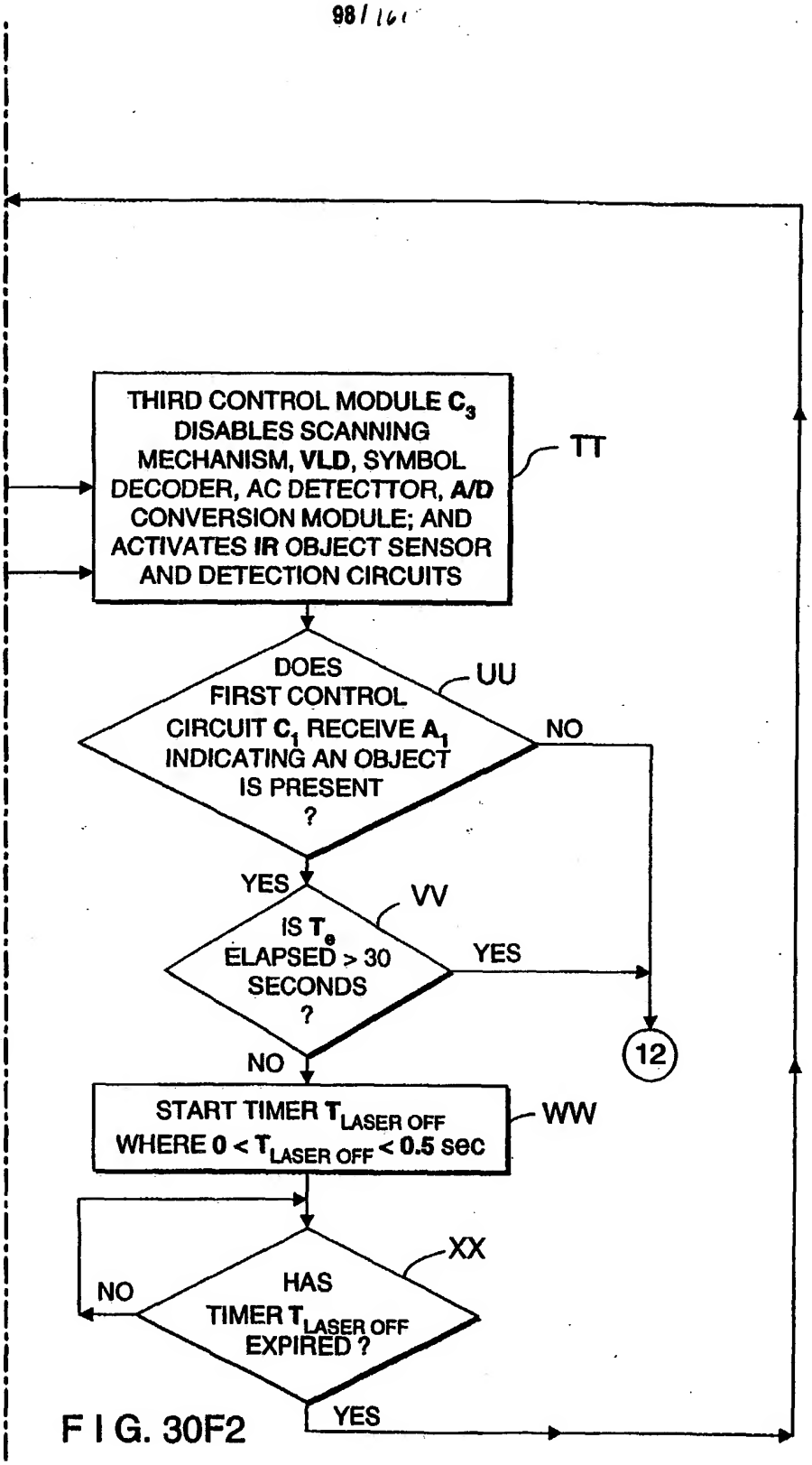

THIRD CONTROL MODULE C_3 DISABLES SCANNING MECHANISM, VLD, SYMBOL DECODER, AC DETECTTOR, A/D CONVERSION MODULE; AND ACTIVATES IR OBJECT SENSOR AND DETECTION CIRCUITS
TT
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE A_1 INDICATING AN OBJECT IS PRESENT ?
UU
NO
YES
IS T_e ELAPSED > 30 SECONDS ?
VV
YES
12
NO
START TIMER $T_{LASER\ OFF}$ WHERE $0 < T_{LASER\ OFF} < 0.5$ sec
WW
HAS TIMER $T_{LASER\ OFF}$ EXPIRED ?
XX
NO
YES

FIG. 30F2

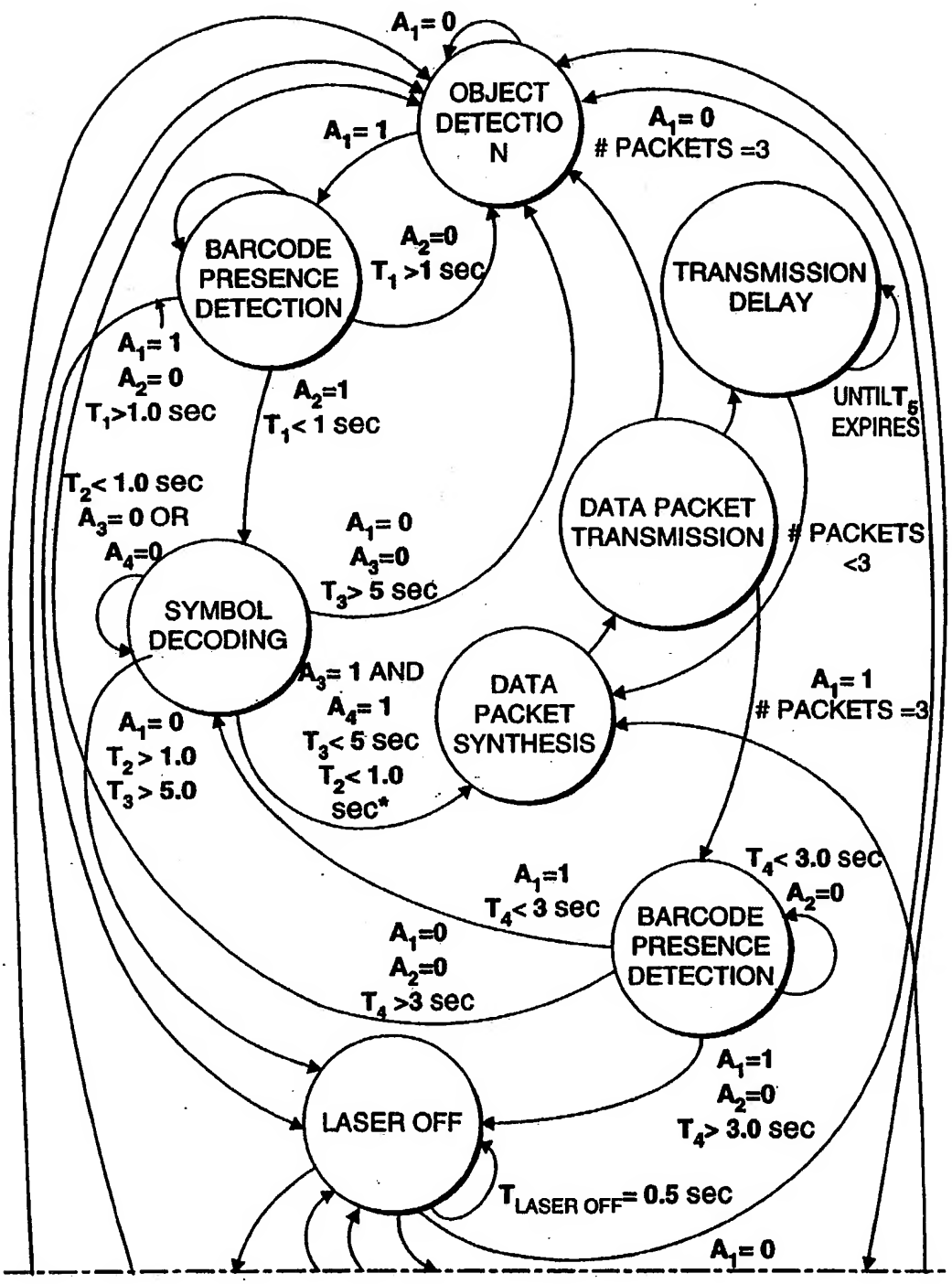

A1= 0
OBJECT DETECTIO N
A1= 1
A1= 0
# PACKETS =3
BARCODE PRESENCE DETECTION
A2=0
T1 >1 sec
TRANSMISSION DELAY
A1= 1
A2= 0
T1>1.0 sec
A2=1
T1< 1 sec
UNTILT5 EXPIRES
T2< 1.0 sec
A3= 0 OR
A4=0
A1= 0
A3=0
T3> 5 sec
DATA PACKET TRANSMISSION
PACKETS <3
SYMBOL DECODING
A3= 1 AND
A4= 1
T3< 5 sec
T2< 1.0 sec*
DATA PACKET SYNTHESIS
A1= 1
# PACKETS =3
A1= 0
T2> 1.0
T3> 5.0
T4< 3.0 sec
A2=0
A1=1
T4< 3 sec
BARCODE PRESENCE DETECTION
A1=0
A2=0
T4 >3 sec
A1=1
A2=0
T4> 3.0 sec
LASER OFF
TLASER OFF= 0.5 sec
A1= 0

FIG. 31A

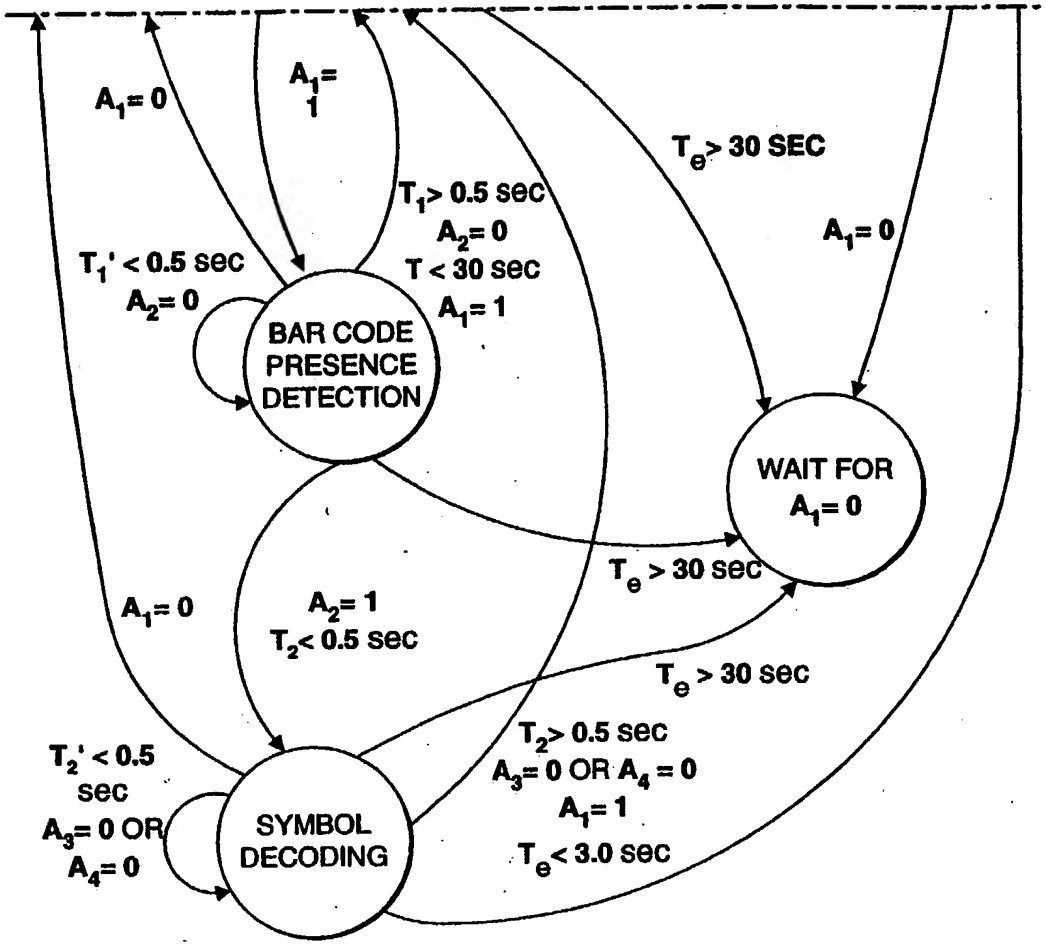

A_1= 0
A_1= 1
T_e> 30 SEC
T_1> 0.5 sec
A_2= 0
T < 30 sec
A_1= 1
A_1= 0
T_1' < 0.5 sec
A_2= 0
BAR CODE PRESENCE DETECTION
WAIT FOR A_1= 0
T_e > 30 sec
A_1= 0
A_2= 1
T_2< 0.5 sec
T_e > 30 sec
T_2> 0.5 sec
A_3= 0 OR A_4 = 0
A_1= 1
T_e< 3.0 sec
T_2' < 0.5 sec
A_3= 0 OR A_4= 0
SYMBOL DECODING
A_3= 1, A_4= 1
T_2' < 0.5 sec
*: SYMBOL CHARACTER DATA IS DIFFERENT THAN DATA ELEMENT IN DECODED SYMBOL DATA BUFFER

FIG. 31B

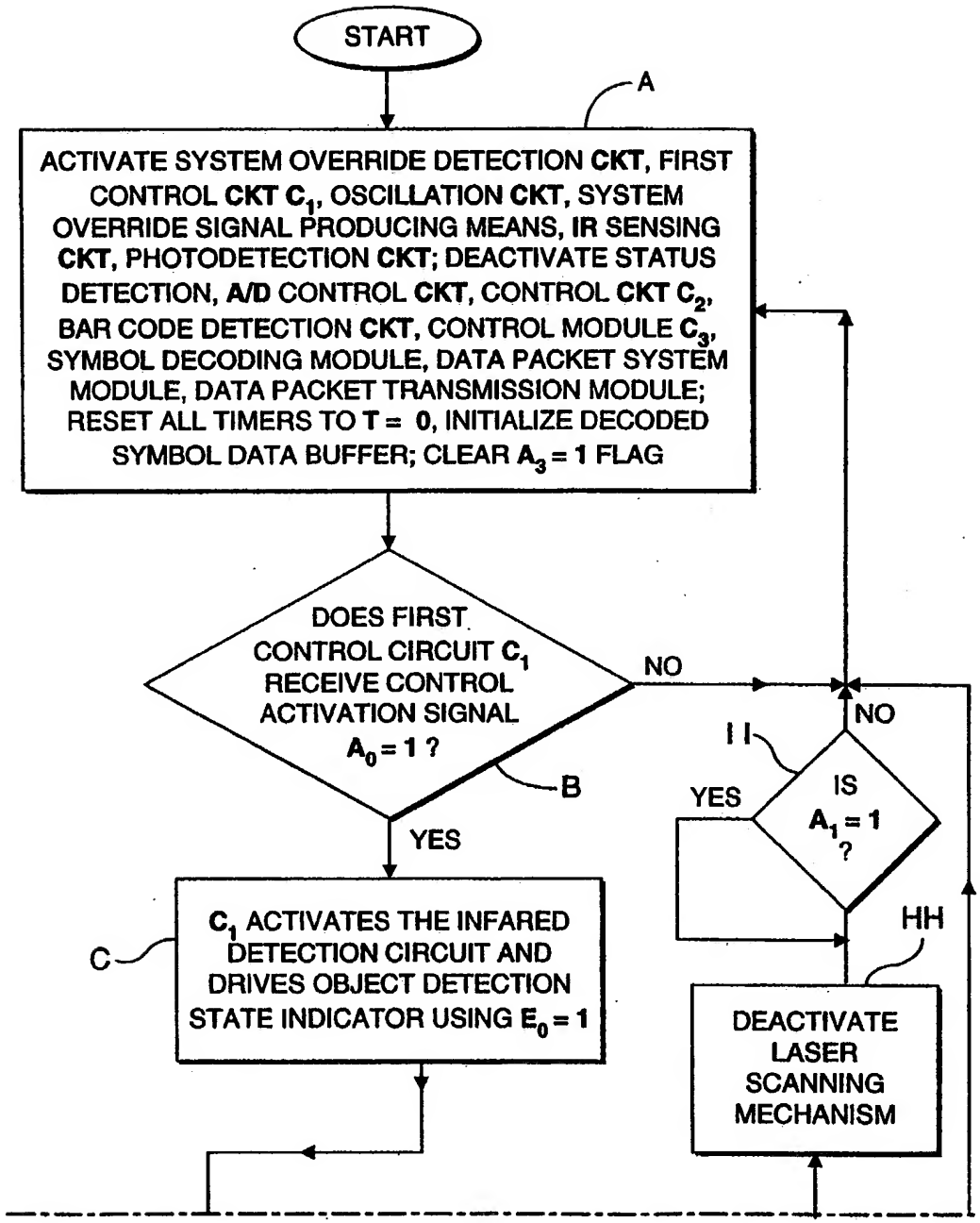

START
A
ACTIVATE SYSTEM OVERRIDE DETECTION CKT, FIRST CONTROL CKT C_1, OSCILLATION CKT, SYSTEM OVERRIDE SIGNAL PRODUCING MEANS, IR SENSING CKT, PHOTODETECTION CKT; DEACTIVATE STATUS DETECTION, A/D CONTROL CKT, CONTROL CKT C_2, BAR CODE DETECTION CKT, CONTROL MODULE C_3, SYMBOL DECODING MODULE, DATA PACKET SYSTEM MODULE, DATA PACKET TRANSMISSION MODULE; RESET ALL TIMERS TO T = 0, INITIALIZE DECODED SYMBOL DATA BUFFER; CLEAR $A_3 = 1$ FLAG
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL $A_0 = 1$?
NO
B
YES
C
C_1 ACTIVATES THE INFARED DETECTION CIRCUIT AND DRIVES OBJECT DETECTION STATE INDICATOR USING $E_0 = 1$
II
NO
IS $A_1 = 1$?
YES
HH
DEACTIVATE LASER SCANNING MECHANISM

FIG. 32A1

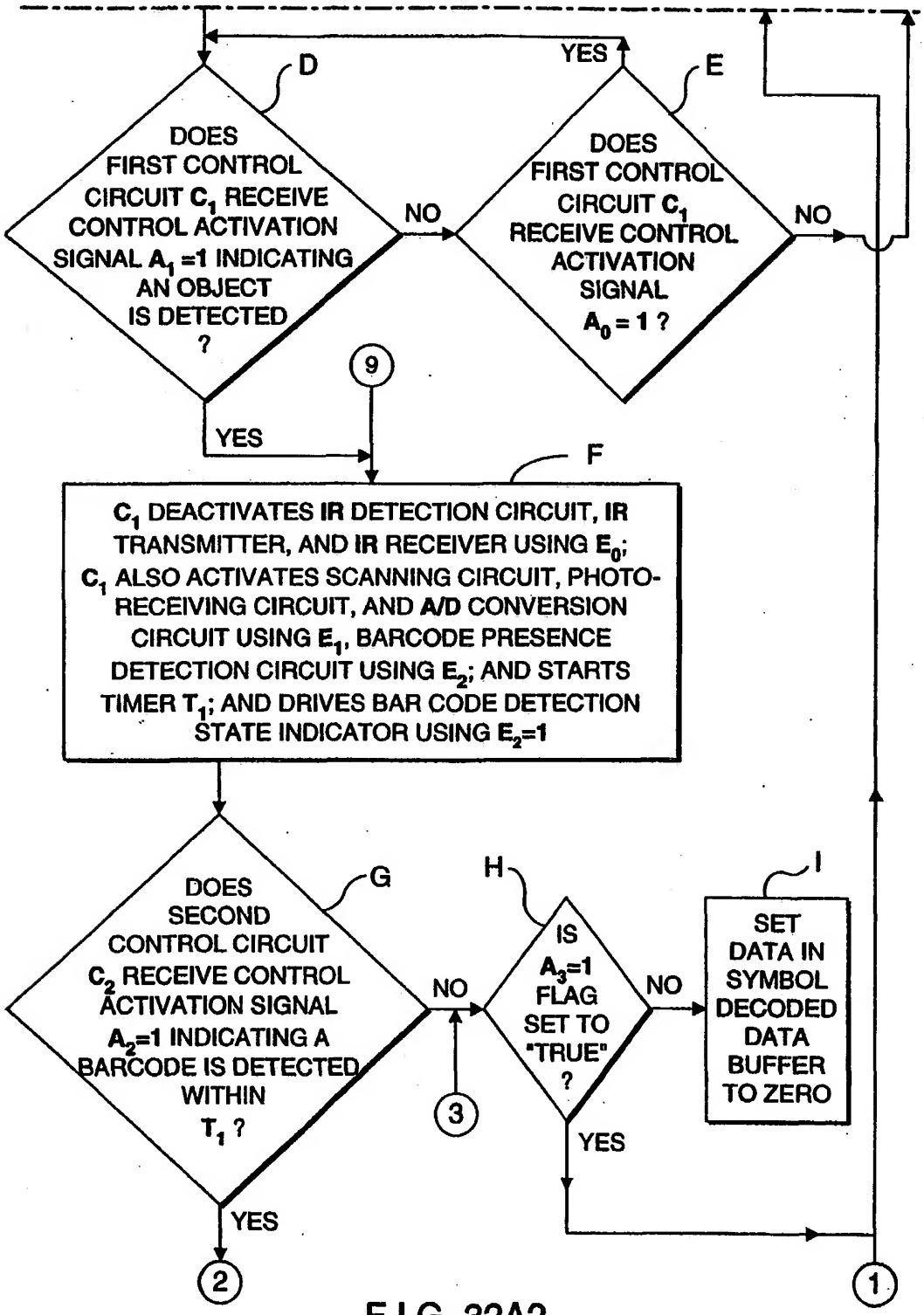

D
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_1 =1 INDICATING AN OBJECT IS DETECTED ?
NO
YES
E
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
NO
9
YES
F
C_1 DEACTIVATES IR DETECTION CIRCUIT, IR TRANSMITTER, AND IR RECEIVER USING E_0; C_1 ALSO ACTIVATES SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT, AND A/D CONVERSION CIRCUIT USING E_1, BARCODE PRESENCE DETECTION CIRCUIT USING E_2; AND STARTS TIMER T_1; AND DRIVES BAR CODE DETECTION STATE INDICATOR USING E_2=1
G
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 INDICATING A BARCODE IS DETECTED WITHIN T_1 ?
NO
H
IS A_3=1 FLAG SET TO "TRUE" ?
NO
I
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
YES
3
YES
2
1

FIG. 32A2

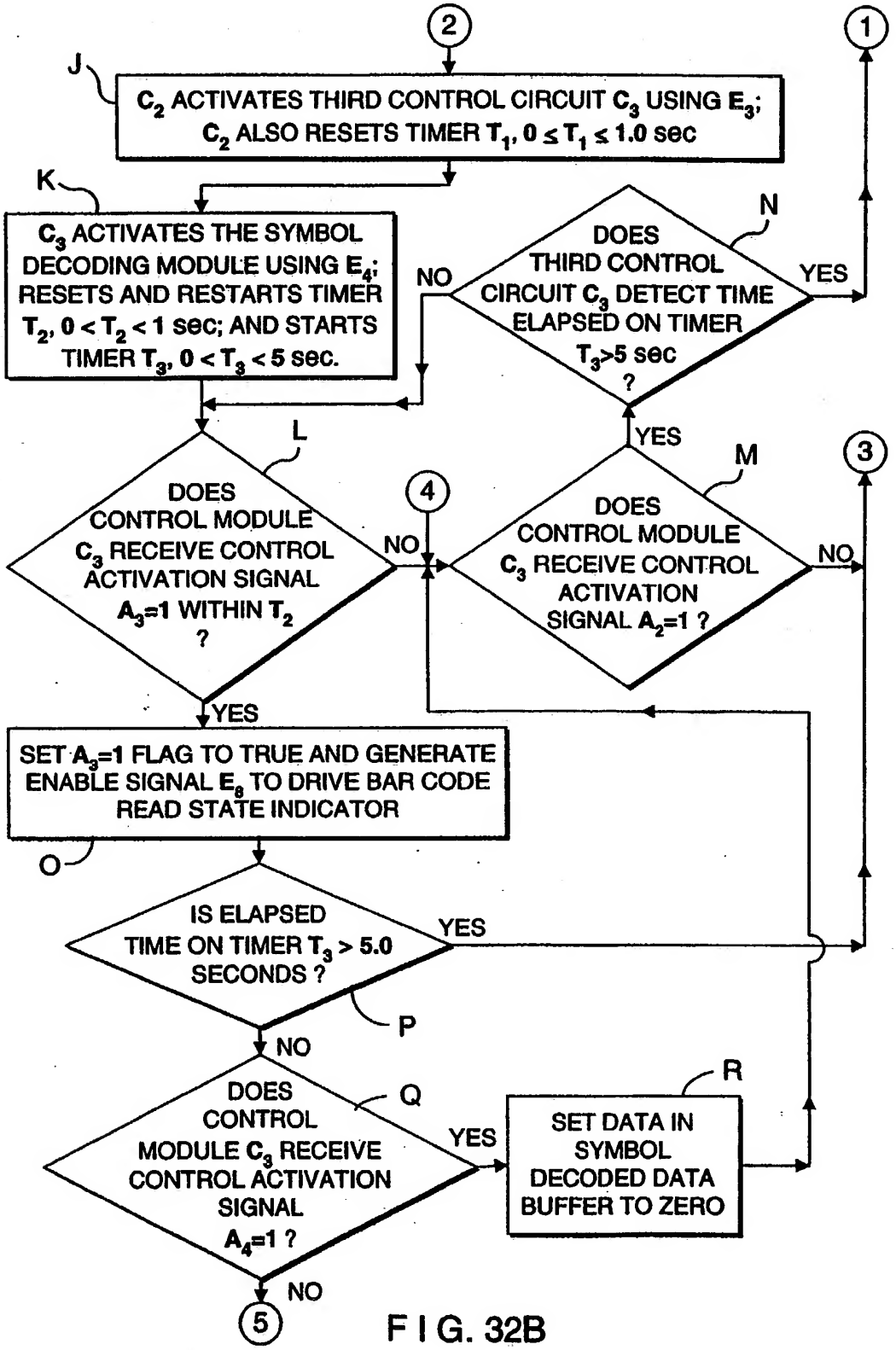

2
1
J
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3; C_2 ALSO RESETS TIMER T_1, $0 \leq T_1 \leq 1.0$ sec
K
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4; RESETS AND RESTARTS TIMER T_2, $0 < T_2 < 1$ sec; AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
N
DOES THIRD CONTROL CIRCUIT C_3 DETECT TIME ELAPSED ON TIMER T_3>5 sec ?
NO
YES
L
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 ?
4
NO
M
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 ?
NO
3
YES
YES
SET A_3=1 FLAG TO TRUE AND GENERATE ENABLE SIGNAL E_8 TO DRIVE BAR CODE READ STATE INDICATOR
O
IS ELAPSED TIME ON TIMER T_3 > 5.0 SECONDS ?
YES
P
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_4=1 ?
Q
YES
R
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
NO
5

FIG. 32B

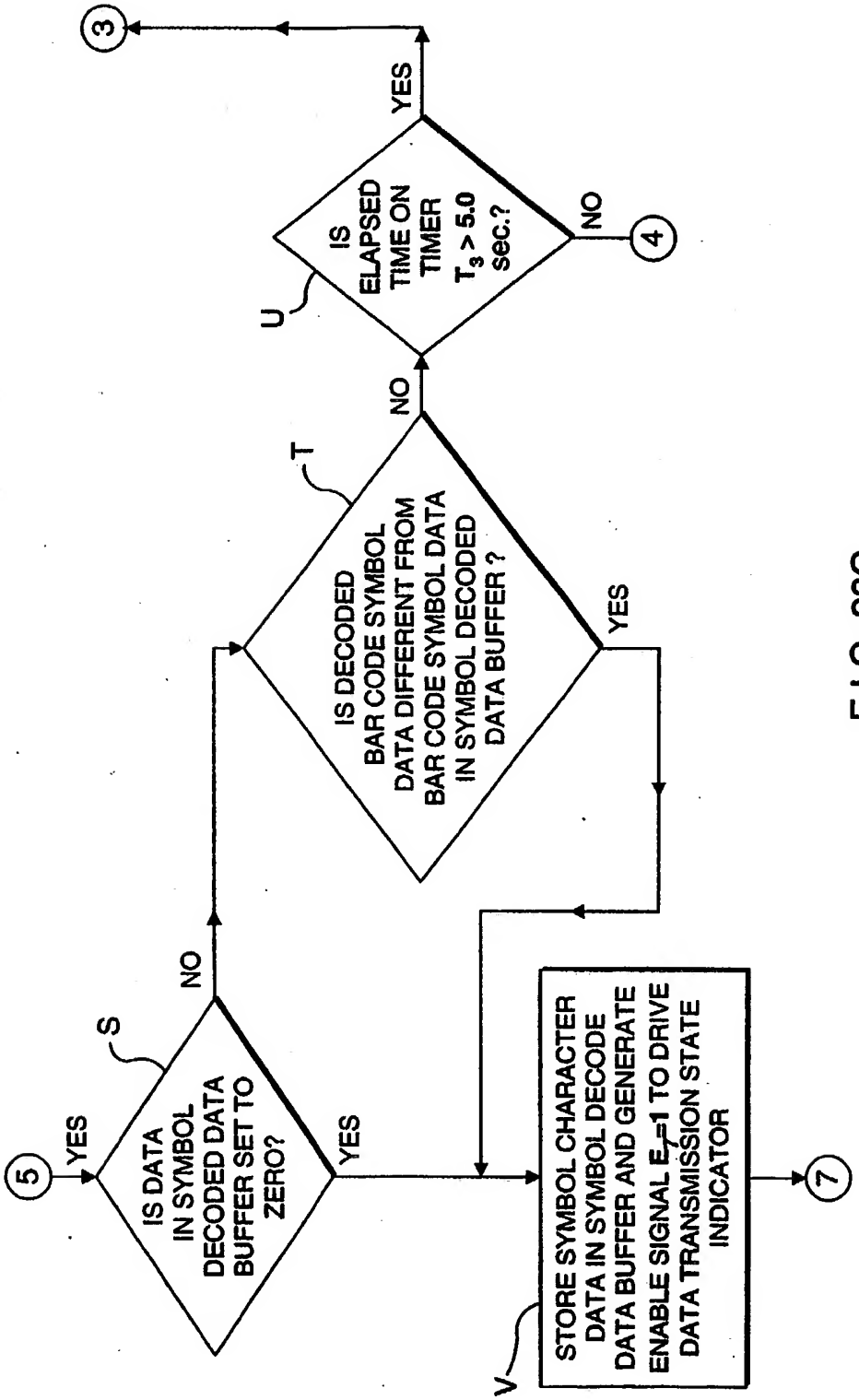

3
YES
IS ELAPSED TIME ON TIMER $T_3 > 5.0$ sec.?
U
NO
4
NO
T
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
YES
NO
S
5
YES
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
YES
V
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER AND GENERATE ENABLE SIGNAL E_7=1 TO DRIVE DATA TRANSMISSION STATE INDICATOR
7

FIG. 32C

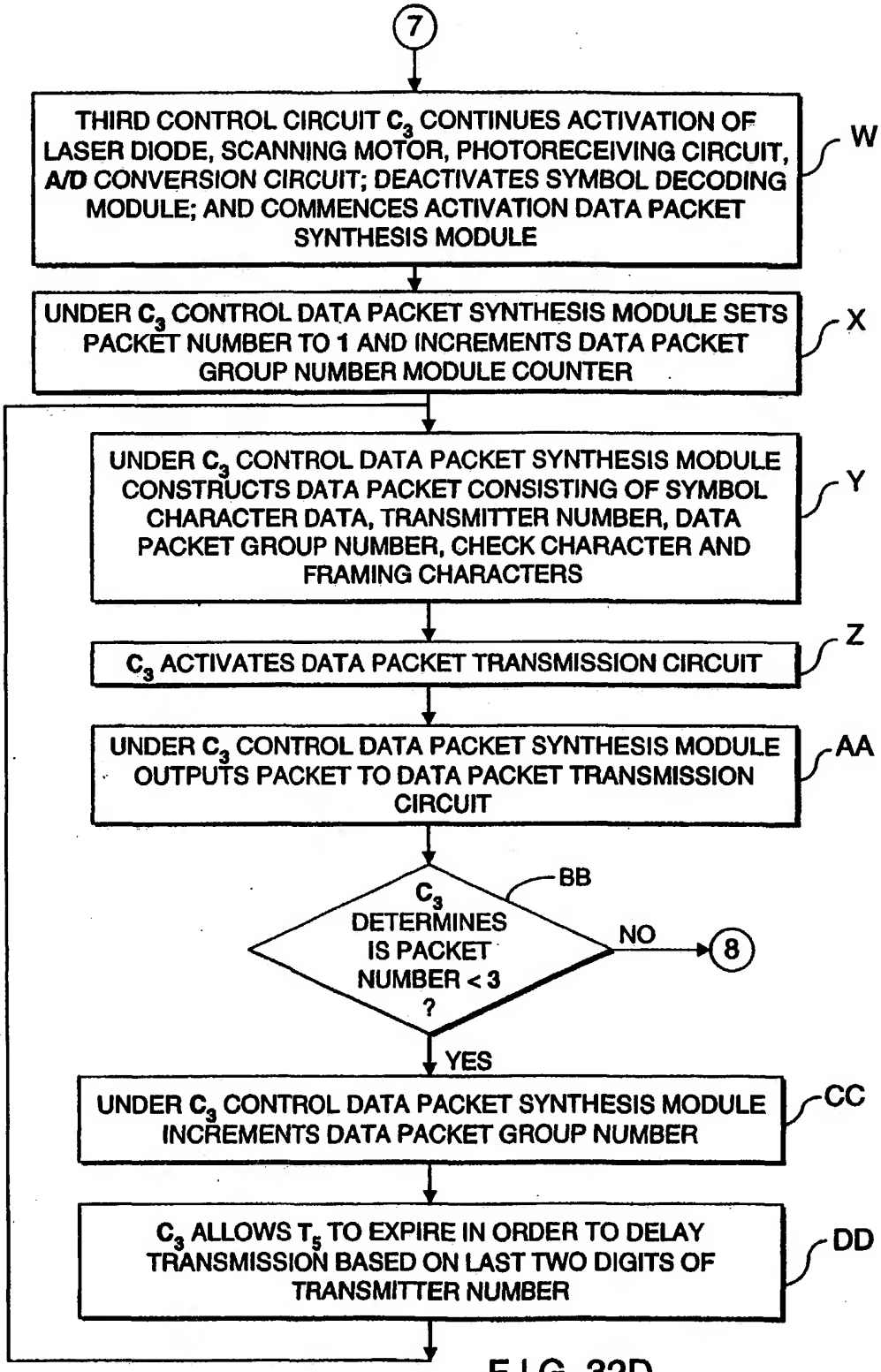

7
THIRD CONTROL CIRCUIT C3 CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION DATA PACKET SYNTHESIS MODULE
W
UNDER C3 CONTROL DATA PACKET SYNTHESIS MODULE SETS PACKET NUMBER TO 1 AND INCREMENTS DATA PACKET GROUP NUMBER MODULE COUNTER
X
UNDER C3 CONTROL DATA PACKET SYNTHESIS MODULE CONSTRUCTS DATA PACKET CONSISTING OF SYMBOL CHARACTER DATA, TRANSMITTER NUMBER, DATA PACKET GROUP NUMBER, CHECK CHARACTER AND FRAMING CHARACTERS
Y
C3 ACTIVATES DATA PACKET TRANSMISSION CIRCUIT
Z
UNDER C3 CONTROL DATA PACKET SYNTHESIS MODULE OUTPUTS PACKET TO DATA PACKET TRANSMISSION CIRCUIT
AA
C3 DETERMINES IS PACKET NUMBER < 3 ?
BB
NO
8
YES
UNDER C3 CONTROL DATA PACKET SYNTHESIS MODULE INCREMENTS DATA PACKET GROUP NUMBER
CC
C3 ALLOWS T5 TO EXPIRE IN ORDER TO DELAY TRANSMISSION BASED ON LAST TWO DIGITS OF TRANSMITTER NUMBER
DD

FIG. 32D

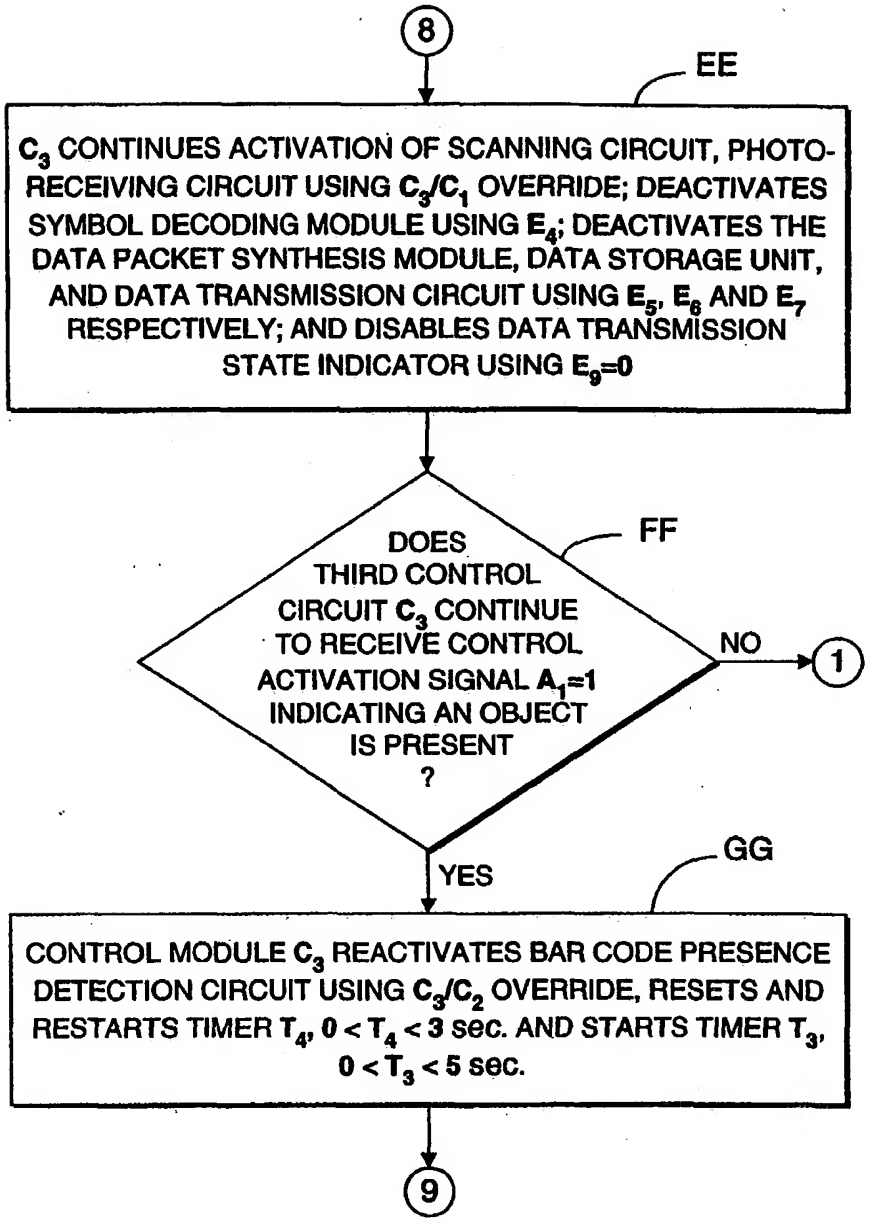

8
EE
C_3 CONTINUES ACTIVATION OF SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT USING C_3/C_1 OVERRIDE; DEACTIVATES SYMBOL DECODING MODULE USING E_4; DEACTIVATES THE DATA PACKET SYNTHESIS MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT USING E_5, E_6 AND E_7 RESPECTIVELY; AND DISABLES DATA TRANSMISSION STATE INDICATOR USING E_9=0
FF
DOES THIRD CONTROL CIRCUIT C_3 CONTINUE TO RECEIVE CONTROL ACTIVATION SIGNAL A_1=1 INDICATING AN OBJECT IS PRESENT ?
NO
1
YES
GG
CONTROL MODULE C_3 REACTIVATES BAR CODE PRESENCE DETECTION CIRCUIT USING C_3/C_2 OVERRIDE, RESETS AND RESTARTS TIMER T_4, $0 < T_4 < 3$ sec. AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
9

FIG. 32E

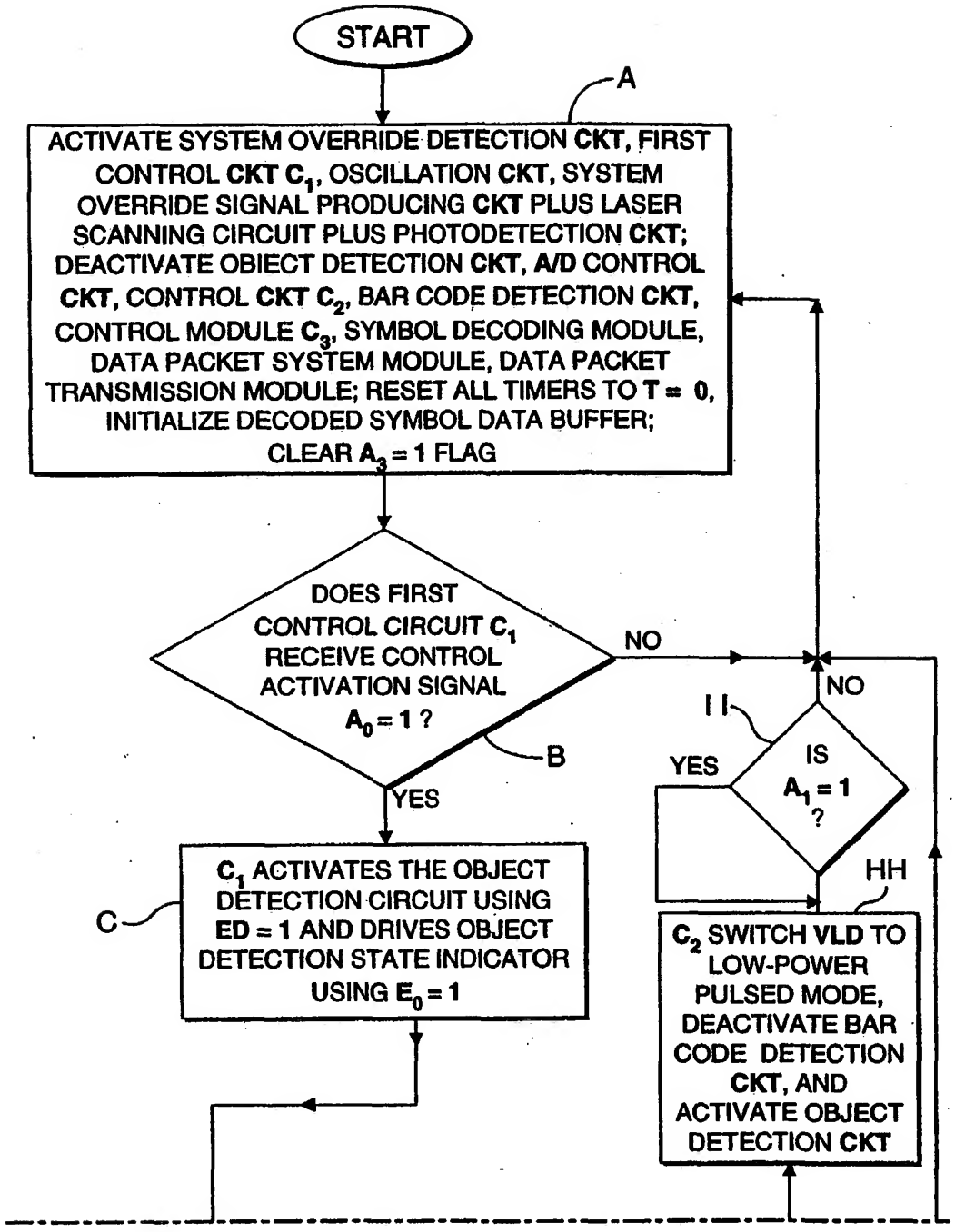

START
A
ACTIVATE SYSTEM OVERRIDE DETECTION CKT, FIRST CONTROL CKT C_1, OSCILLATION CKT, SYSTEM OVERRIDE SIGNAL PRODUCING CKT PLUS LASER SCANNING CIRCUIT PLUS PHOTODETECTION CKT; DEACTIVATE OBIECT DETECTION CKT, A/D CONTROL CKT, CONTROL CKT C_2, BAR CODE DETECTION CKT, CONTROL MODULE C_3, SYMBOL DECODING MODULE, DATA PACKET SYSTEM MODULE, DATA PACKET TRANSMISSION MODULE; RESET ALL TIMERS TO T = 0, INITIALIZE DECODED SYMBOL DATA BUFFER; CLEAR A_3 = 1 FLAG
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
NO
B
YES
C
C_1 ACTIVATES THE OBJECT DETECTION CIRCUIT USING ED = 1 AND DRIVES OBJECT DETECTION STATE INDICATOR USING E_0 = 1
II
NO
YES
IS A_1 = 1 ?
HH
C_2 SWITCH VLD TO LOW-POWER PULSED MODE, DEACTIVATE BAR CODE DETECTION CKT, AND ACTIVATE OBJECT DETECTION CKT

FIG. 33A1

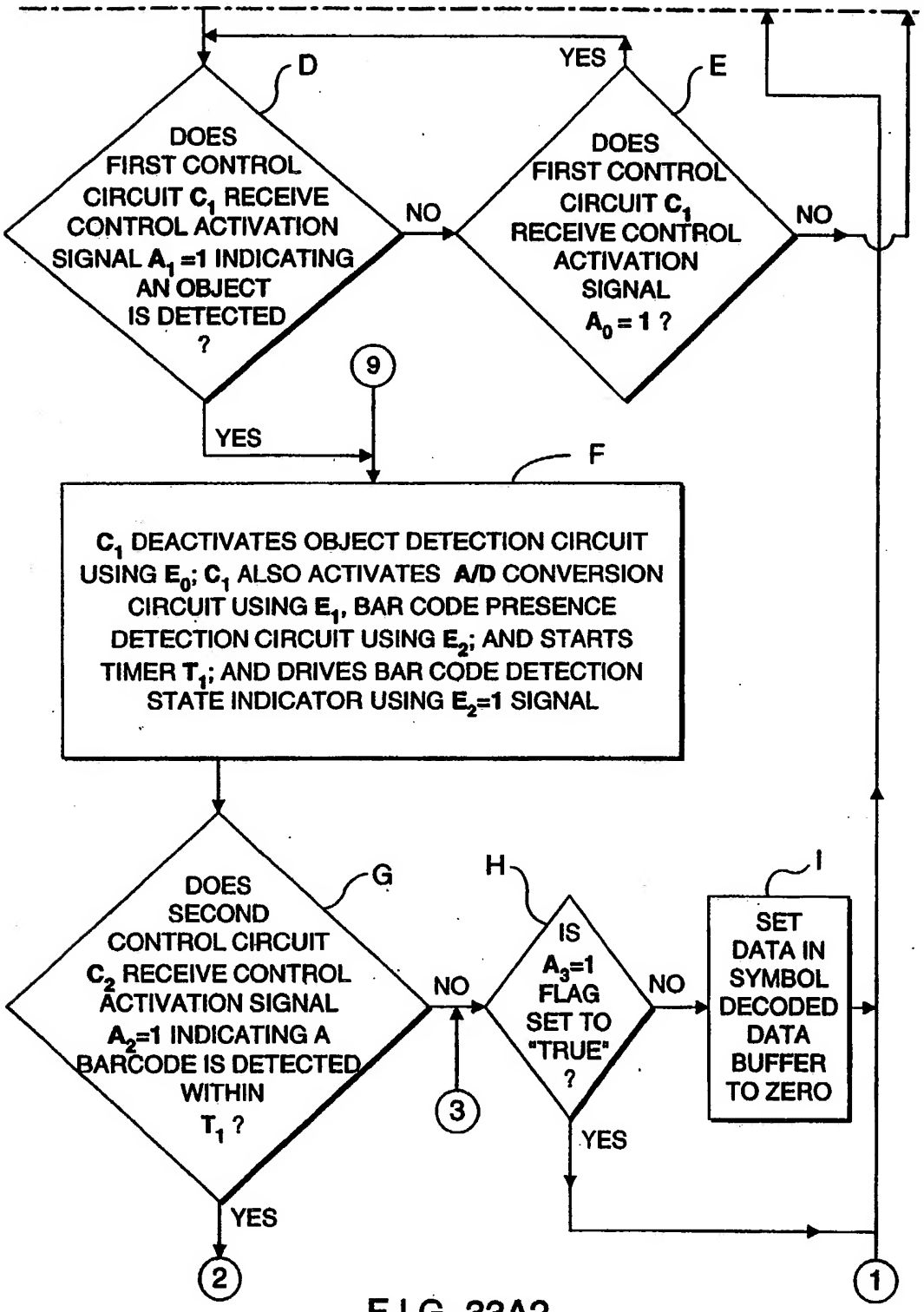

D
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_1 =1 INDICATING AN OBJECT IS DETECTED ?
NO
YES
E
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
NO
9
YES
F
C_1 DEACTIVATES OBJECT DETECTION CIRCUIT USING E_0; C_1 ALSO ACTIVATES A/D CONVERSION CIRCUIT USING E_1, BAR CODE PRESENCE DETECTION CIRCUIT USING E_2; AND STARTS TIMER T_1; AND DRIVES BAR CODE DETECTION STATE INDICATOR USING E_2=1 SIGNAL
G
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 INDICATING A BARCODE IS DETECTED WITHIN T_1 ?
NO
H
IS A_3=1 FLAG SET TO "TRUE" ?
NO
I
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
YES
YES
3
2
1

FIG. 33A2

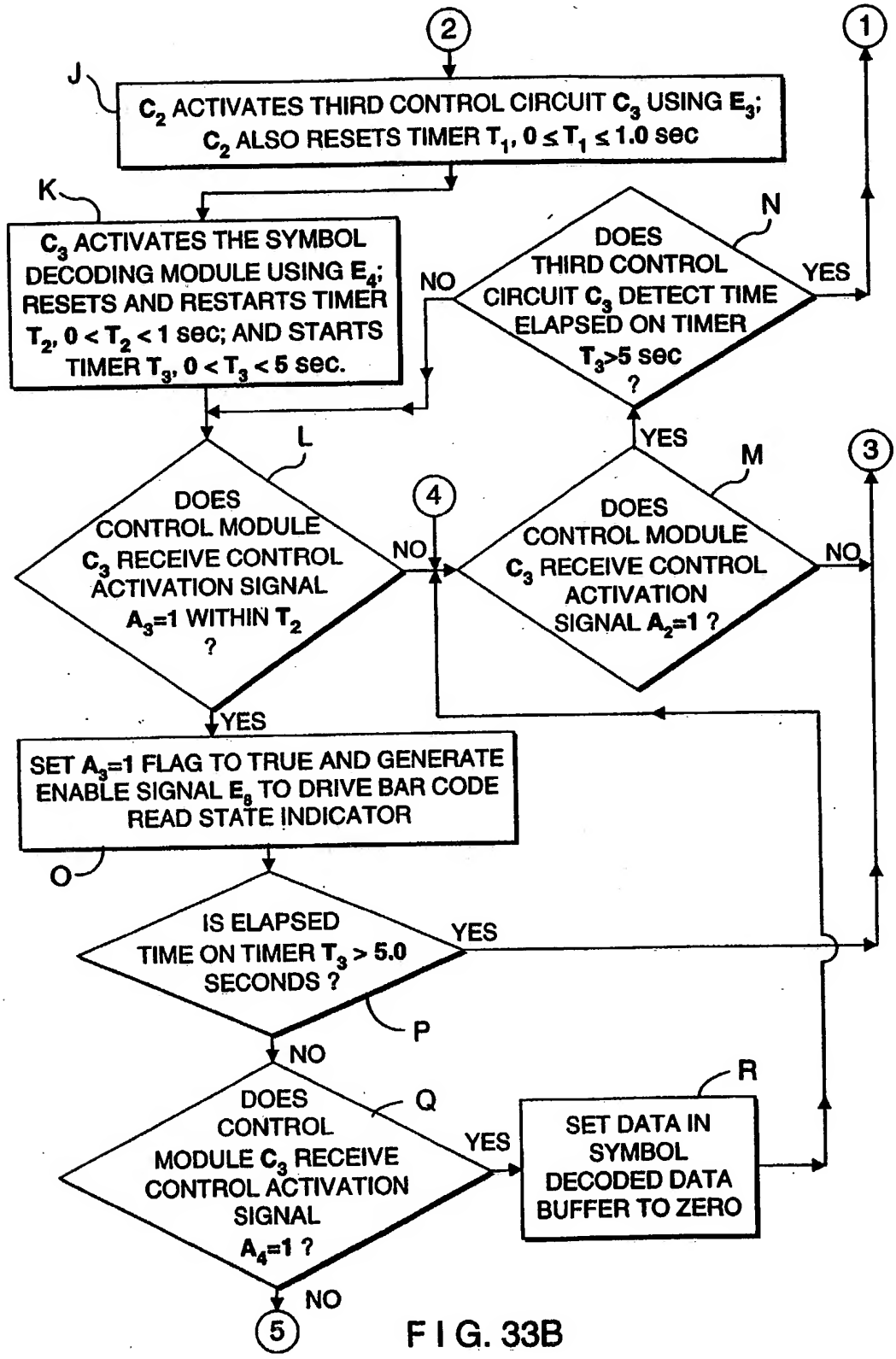

2
1
J
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3; C_2 ALSO RESETS TIMER T_1, $0 \leq T_1 \leq 1.0$ sec
K
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4; RESETS AND RESTARTS TIMER T_2, $0 < T_2 < 1$ sec; AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
N
DOES THIRD CONTROL CIRCUIT C_3 DETECT TIME ELAPSED ON TIMER T_3>5 sec ?
NO
YES
YES
L
M
3
4
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 ?
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 ?
NO
YES
SET A_3=1 FLAG TO TRUE AND GENERATE ENABLE SIGNAL E_8 TO DRIVE BAR CODE READ STATE INDICATOR
O
IS ELAPSED TIME ON TIMER T_3 > 5.0 SECONDS ?
YES
P
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_4=1 ?
Q
YES
R
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
NO
5

FIG. 33B

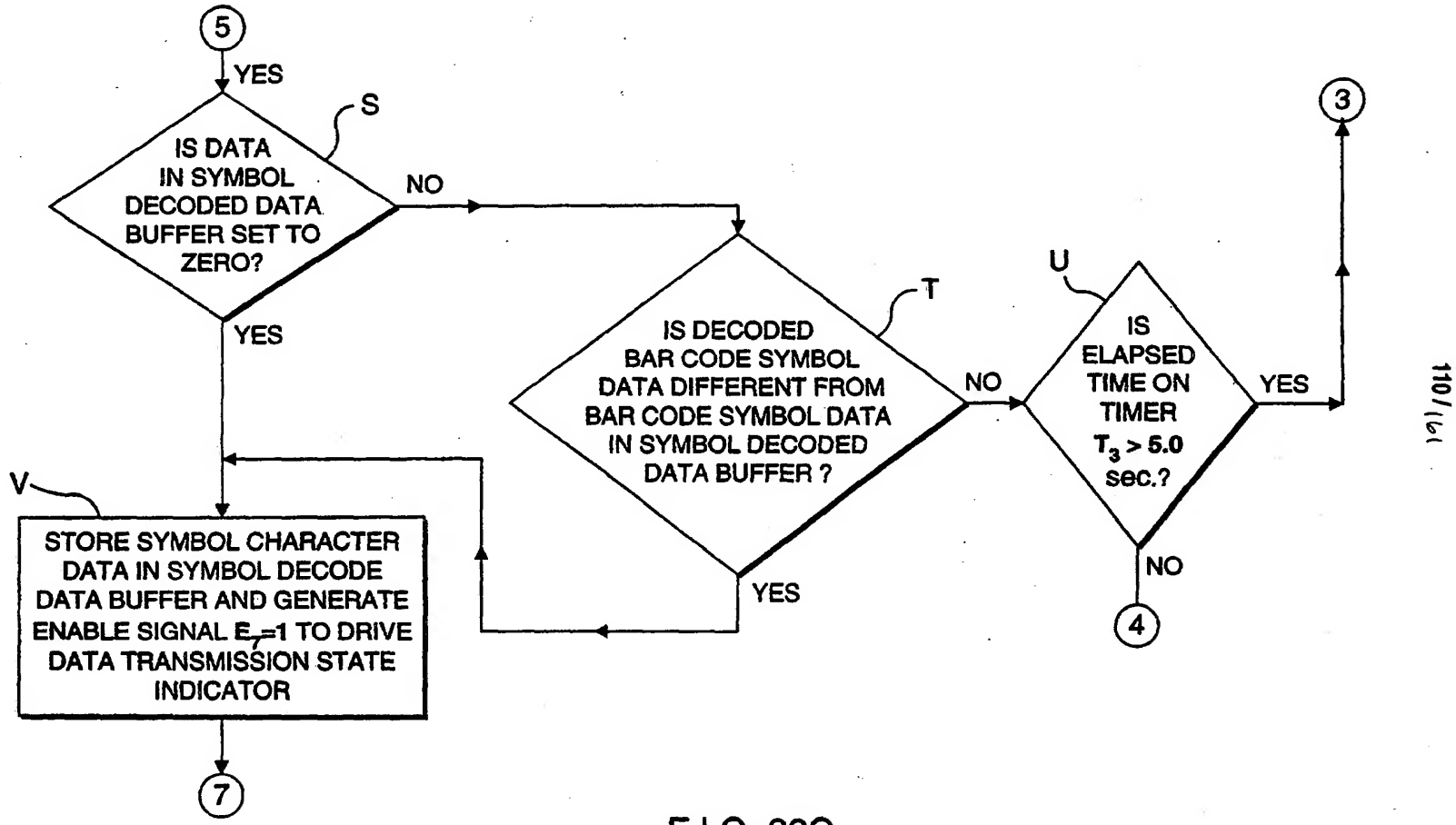

5
YES
S
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
NO
YES
T
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
NO
YES
U
IS ELAPSED TIME ON TIMER $T_3 > 5.0$ sec.?
YES
NO
3
4
V
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER AND GENERATE ENABLE SIGNAL E_7=1 TO DRIVE DATA TRANSMISSION STATE INDICATOR
7
110/61

FIG. 33C

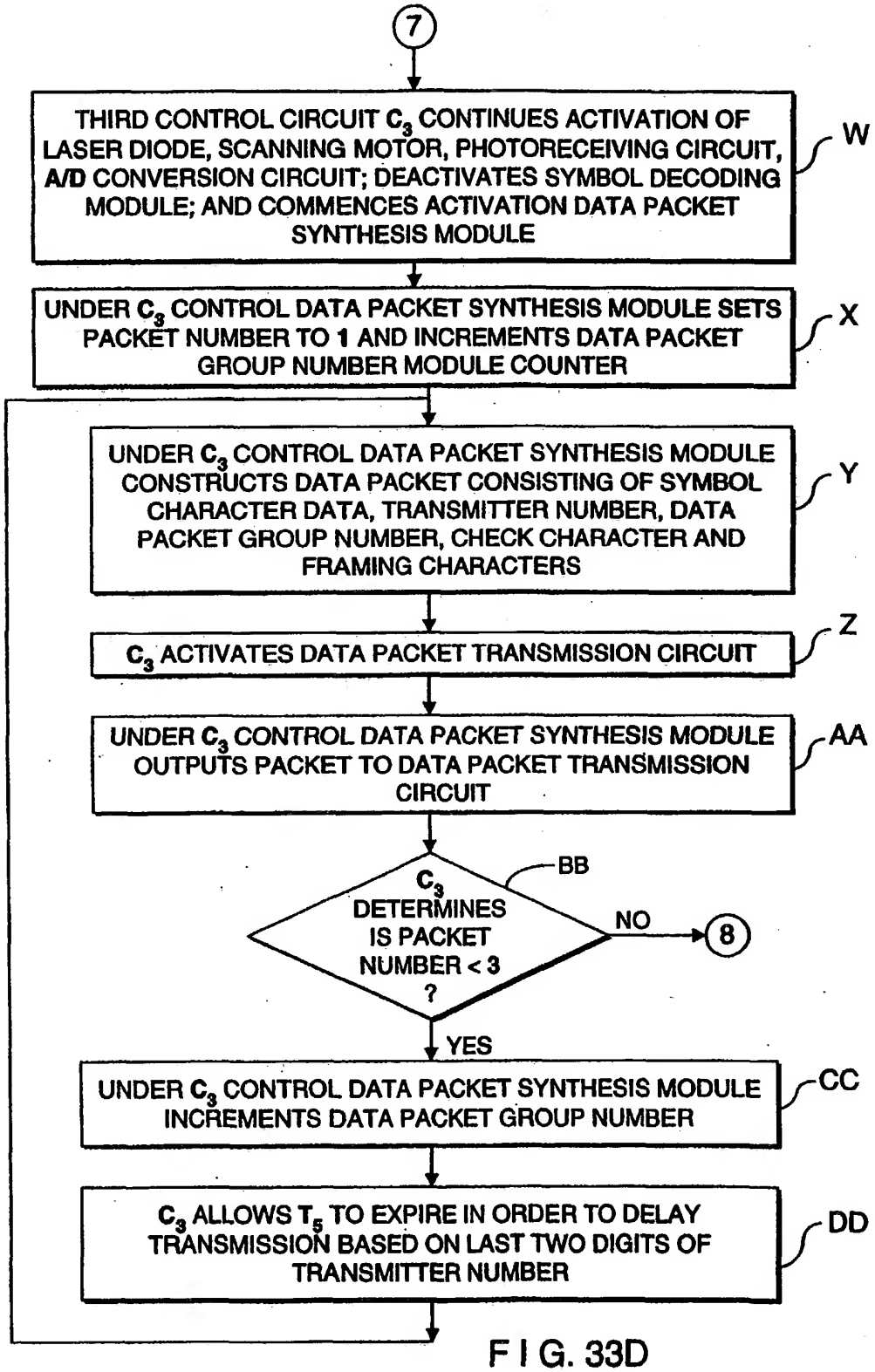

7
THIRD CONTROL CIRCUIT C3 CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION DATA PACKET SYNTHESIS MODULE
W
UNDER C3 CONTROL DATA PACKET SYNTHESIS MODULE SETS PACKET NUMBER TO 1 AND INCREMENTS DATA PACKET GROUP NUMBER MODULE COUNTER
X
UNDER C3 CONTROL DATA PACKET SYNTHESIS MODULE CONSTRUCTS DATA PACKET CONSISTING OF SYMBOL CHARACTER DATA, TRANSMITTER NUMBER, DATA PACKET GROUP NUMBER, CHECK CHARACTER AND FRAMING CHARACTERS
Y
C3 ACTIVATES DATA PACKET TRANSMISSION CIRCUIT
Z
UNDER C3 CONTROL DATA PACKET SYNTHESIS MODULE OUTPUTS PACKET TO DATA PACKET TRANSMISSION CIRCUIT
AA
C3 DETERMINES IS PACKET NUMBER < 3 ?
BB
NO
8
YES
UNDER C3 CONTROL DATA PACKET SYNTHESIS MODULE INCREMENTS DATA PACKET GROUP NUMBER
CC
C3 ALLOWS T5 TO EXPIRE IN ORDER TO DELAY TRANSMISSION BASED ON LAST TWO DIGITS OF TRANSMITTER NUMBER
DD

FIG. 33D

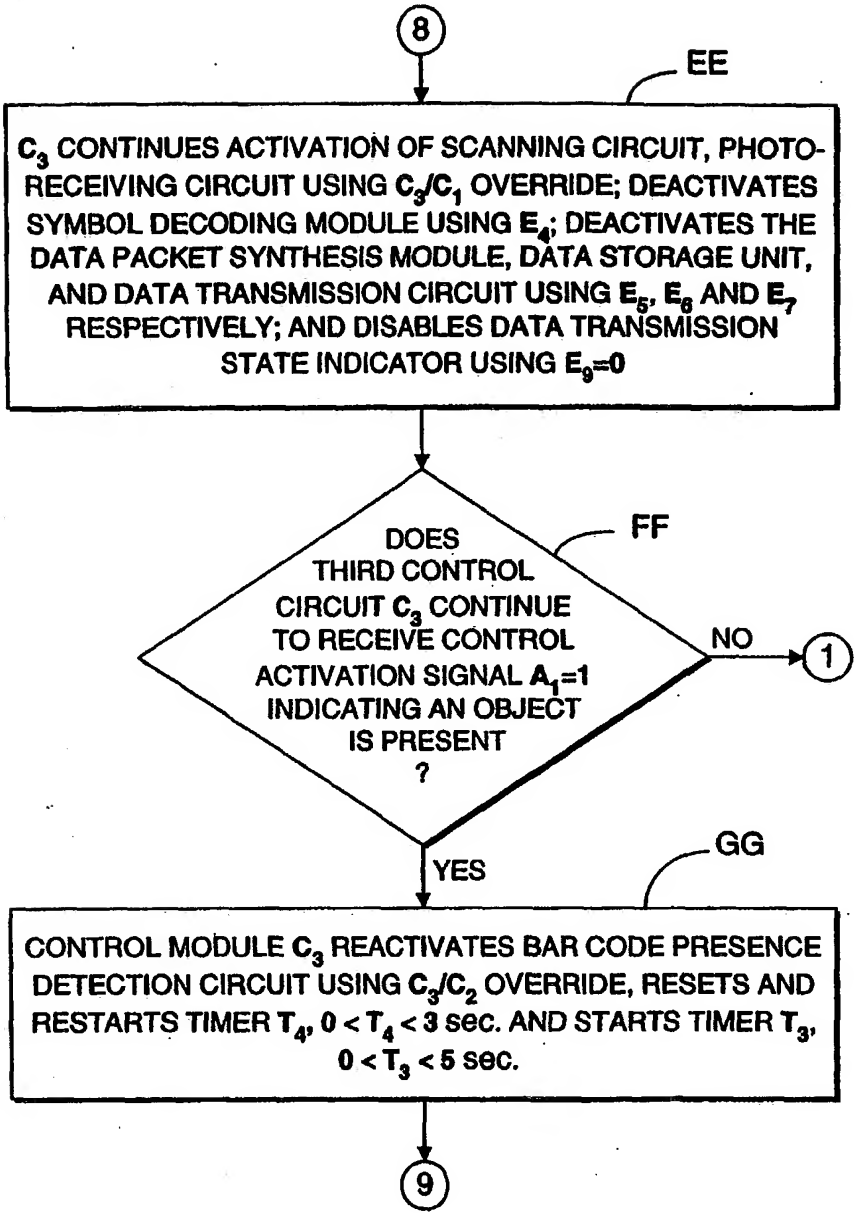

8
EE
C3 CONTINUES ACTIVATION OF SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT USING C3/C1 OVERRIDE; DEACTIVATES SYMBOL DECODING MODULE USING E4; DEACTIVATES THE DATA PACKET SYNTHESIS MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT USING E5, E6 AND E7 RESPECTIVELY; AND DISABLES DATA TRANSMISSION STATE INDICATOR USING E9=0
FF
DOES THIRD CONTROL CIRCUIT C3 CONTINUE TO RECEIVE CONTROL ACTIVATION SIGNAL A1=1 INDICATING AN OBJECT IS PRESENT ?
NO
1
YES
GG
CONTROL MODULE C3 REACTIVATES BAR CODE PRESENCE DETECTION CIRCUIT USING C3/C2 OVERRIDE, RESETS AND RESTARTS TIMER T4, 0 < T4 < 3 sec. AND STARTS TIMER T3, 0 < T3 < 5 sec.
9

FIG. 33E

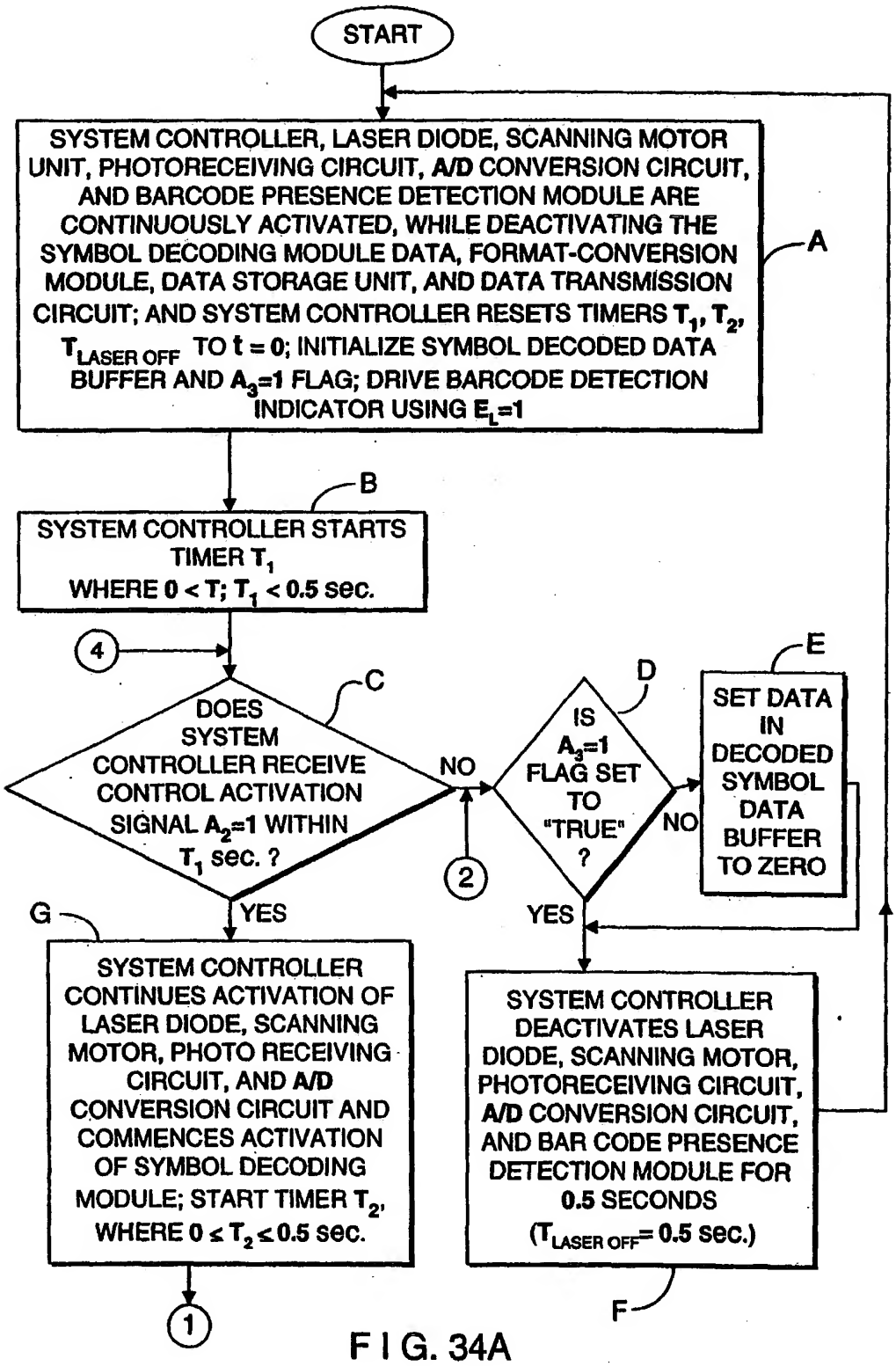

START
SYSTEM CONTROLLER, LASER DIODE, SCANNING MOTOR UNIT, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT, AND BARCODE PRESENCE DETECTION MODULE ARE CONTINUOUSLY ACTIVATED, WHILE DEACTIVATING THE SYMBOL DECODING MODULE DATA, FORMAT-CONVERSION MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT; AND SYSTEM CONTROLLER RESETS TIMERS T_1, T_2, $T_{LASER\ OFF}$ TO t = 0; INITIALIZE SYMBOL DECODED DATA BUFFER AND A_3=1 FLAG; DRIVE BARCODE DETECTION INDICATOR USING E_L=1
A
B
SYSTEM CONTROLLER STARTS TIMER T_1 WHERE 0 < T; T_1 < 0.5 sec.
4
C
DOES SYSTEM CONTROLLER RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 WITHIN T_1 sec. ?
NO
YES
D
IS A_3=1 FLAG SET TO "TRUE" ?
NO
YES
E
SET DATA IN DECODED SYMBOL DATA BUFFER TO ZERO
2
G
SYSTEM CONTROLLER CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTO RECEIVING CIRCUIT, AND A/D CONVERSION CIRCUIT AND COMMENCES ACTIVATION OF SYMBOL DECODING MODULE; START TIMER T_2, WHERE 0 ≤ T_2 ≤ 0.5 sec.
SYSTEM CONTROLLER DEACTIVATES LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT, AND BAR CODE PRESENCE DETECTION MODULE FOR 0.5 SECONDS ($T_{LASER\ OFF}$= 0.5 sec.)
F
1

FIG. 34A

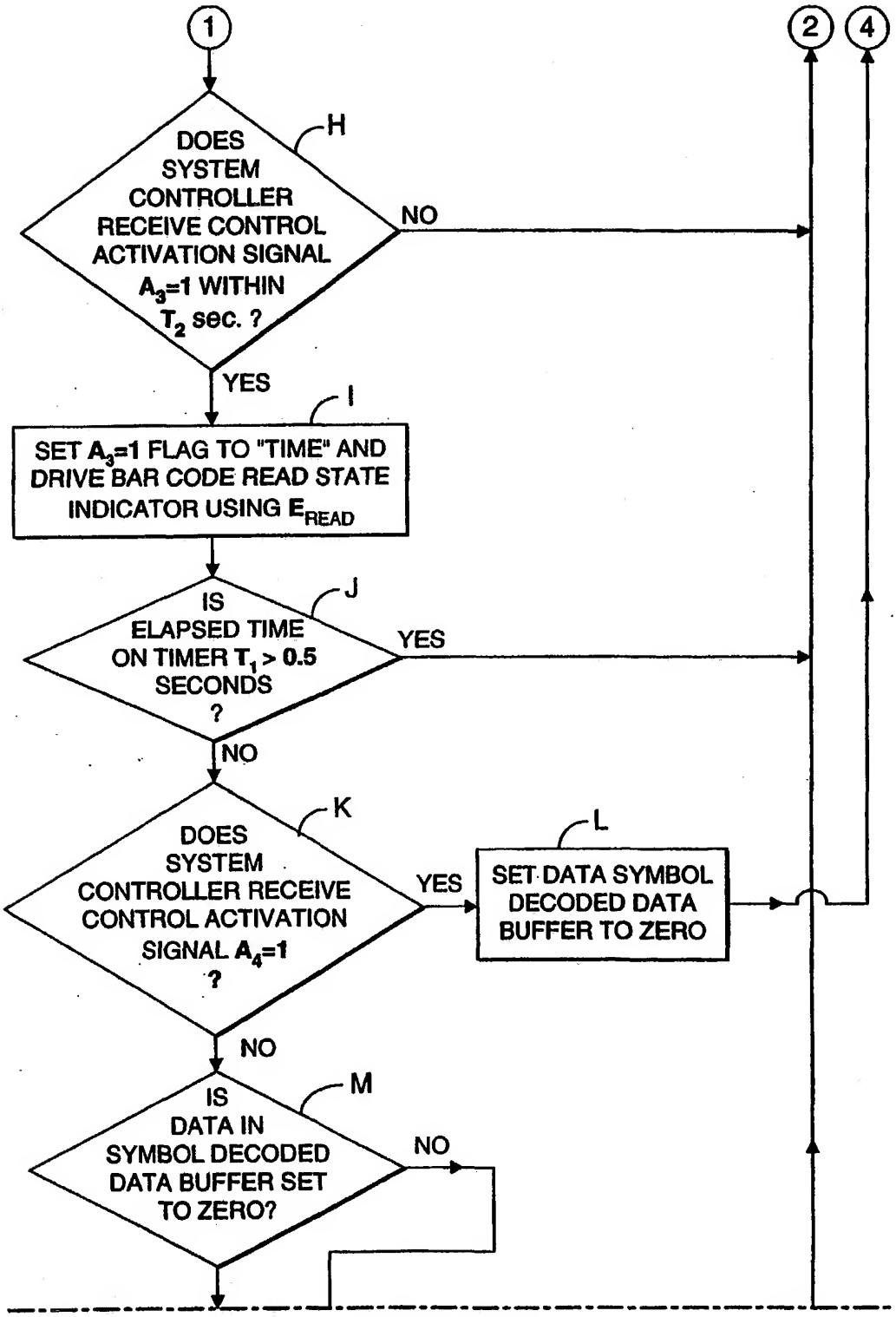

1
2
4
H
DOES SYSTEM CONTROLLER RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 sec. ?
NO
YES
I
SET A_3=1 FLAG TO "TIME" AND DRIVE BAR CODE READ STATE INDICATOR USING E_{READ}
J
IS ELAPSED TIME ON TIMER T_1 > 0.5 SECONDS ?
YES
NO
K
DOES SYSTEM CONTROLLER RECEIVE CONTROL ACTIVATION SIGNAL A_4=1 ?
YES
L
SET DATA SYMBOL DECODED DATA BUFFER TO ZERO
NO
M
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
NO

FIG. 34B1

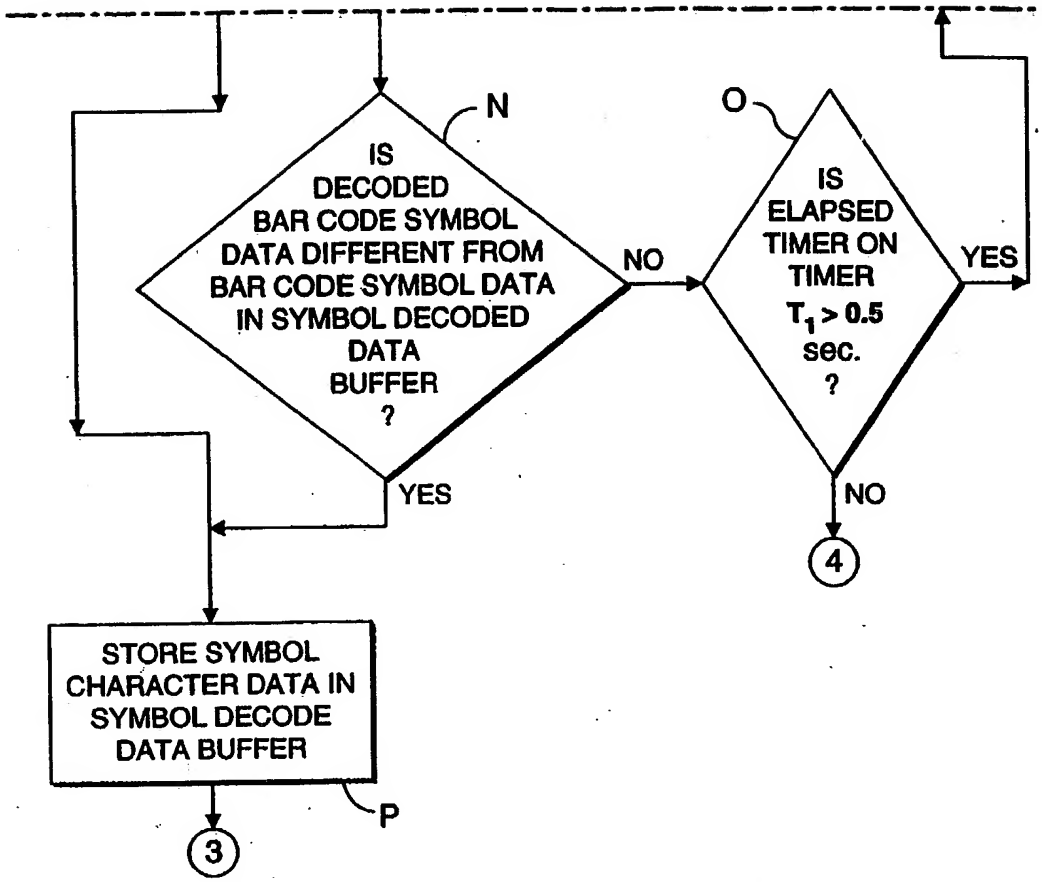

N
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
NO
O
IS ELAPSED TIMER ON TIMER $T_1 > 0.5$ sec. ?
YES
NO
4
YES
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER
P
3

FIG. 34B2

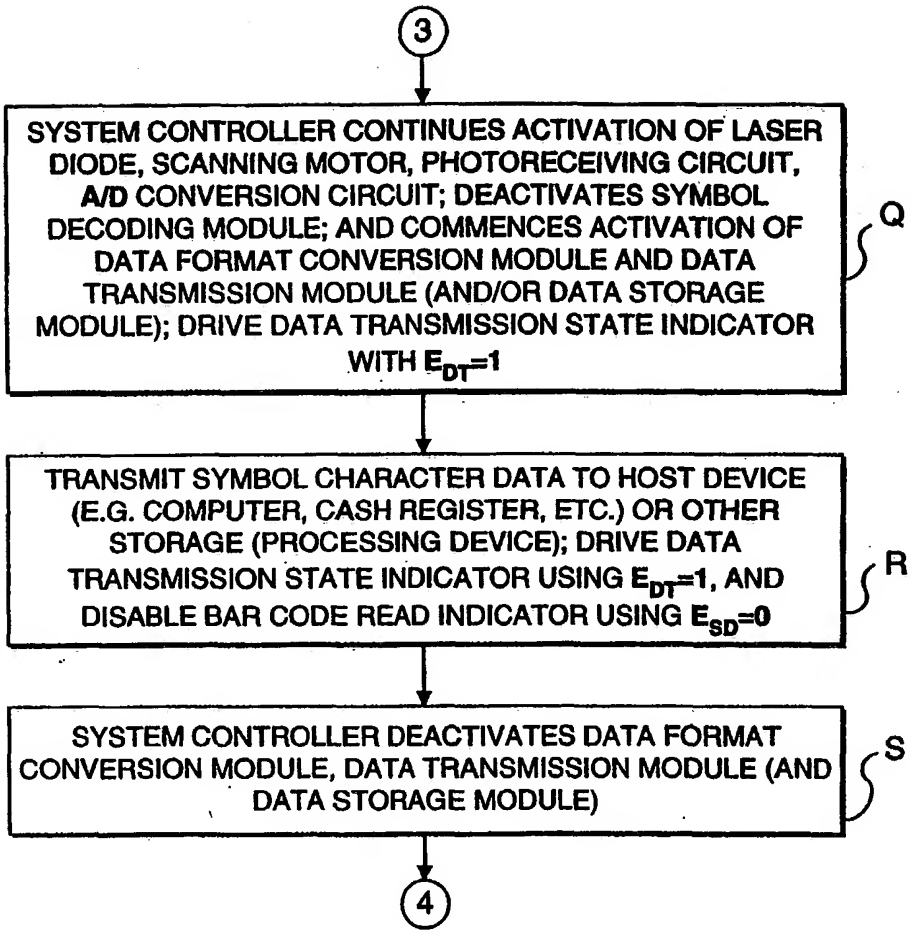

3
SYSTEM CONTROLLER CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION OF DATA FORMAT CONVERSION MODULE AND DATA TRANSMISSION MODULE (AND/OR DATA STORAGE MODULE); DRIVE DATA TRANSMISSION STATE INDICATOR WITH E_{DT}=1
Q
TRANSMIT SYMBOL CHARACTER DATA TO HOST DEVICE (E.G. COMPUTER, CASH REGISTER, ETC.) OR OTHER STORAGE (PROCESSING DEVICE); DRIVE DATA TRANSMISSION STATE INDICATOR USING E_{DT}=1, AND DISABLE BAR CODE READ INDICATOR USING E_{SD}=0
R
SYSTEM CONTROLLER DEACTIVATES DATA FORMAT CONVERSION MODULE, DATA TRANSMISSION MODULE (AND DATA STORAGE MODULE)
S
4

FIG. 34C

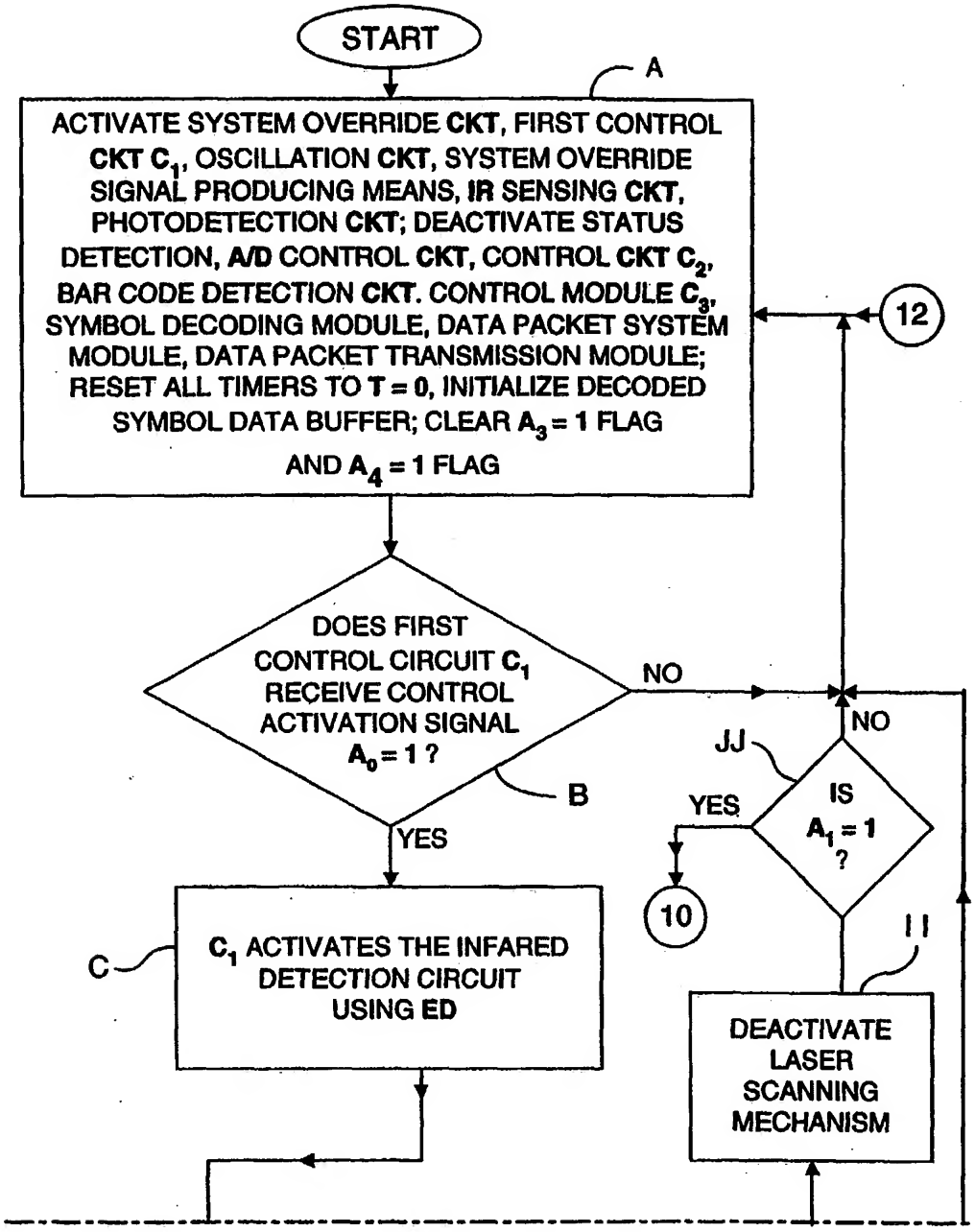

START
A
ACTIVATE SYSTEM OVERRIDE CKT, FIRST CONTROL CKT C_1, OSCILLATION CKT, SYSTEM OVERRIDE SIGNAL PRODUCING MEANS, IR SENSING CKT, PHOTODETECTION CKT; DEACTIVATE STATUS DETECTION, A/D CONTROL CKT, CONTROL CKT C_2, BAR CODE DETECTION CKT. CONTROL MODULE C_3, SYMBOL DECODING MODULE, DATA PACKET SYSTEM MODULE, DATA PACKET TRANSMISSION MODULE; RESET ALL TIMERS TO T = 0, INITIALIZE DECODED SYMBOL DATA BUFFER; CLEAR A_3 = 1 FLAG AND A_4 = 1 FLAG
12
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
NO
B
YES
JJ
NO
IS A_1 = 1 ?
YES
10
C
C_1 ACTIVATES THE INFARED DETECTION CIRCUIT USING ED
II
DEACTIVATE LASER SCANNING MECHANISM

FIG. 35A1

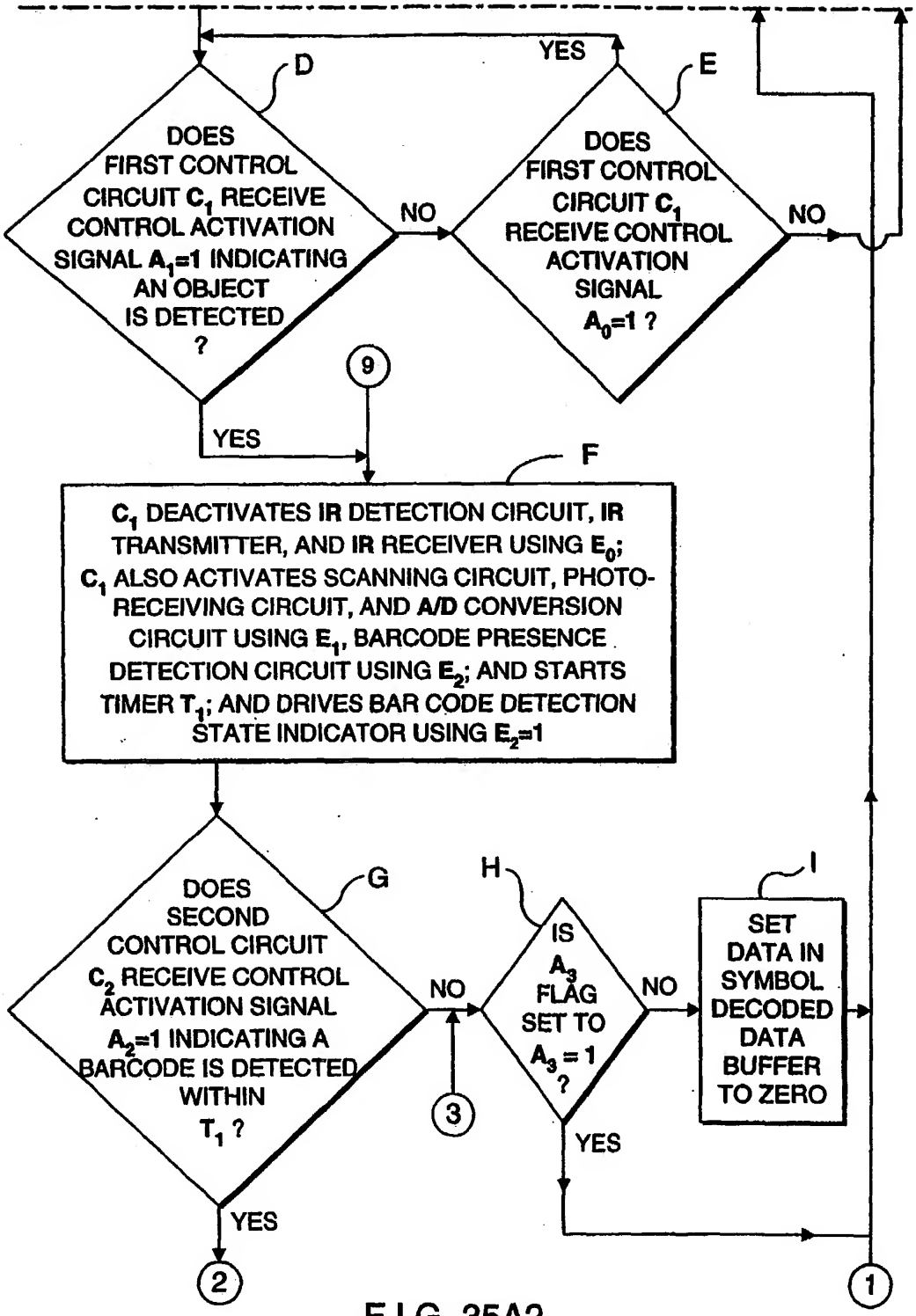

D
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_1=1 INDICATING AN OBJECT IS DETECTED ?
NO
YES
E
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0=1 ?
NO
YES
9
F
C_1 DEACTIVATES IR DETECTION CIRCUIT, IR TRANSMITTER, AND IR RECEIVER USING E_0; C_1 ALSO ACTIVATES SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT, AND A/D CONVERSION CIRCUIT USING E_1, BARCODE PRESENCE DETECTION CIRCUIT USING E_2; AND STARTS TIMER T_1; AND DRIVES BAR CODE DETECTION STATE INDICATOR USING E_2=1
G
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 INDICATING A BARCODE IS DETECTED WITHIN T_1 ?
NO
YES
H
IS A_3 FLAG SET TO A_3 = 1 ?
NO
YES
I
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
3
1
2

FIG. 35A2

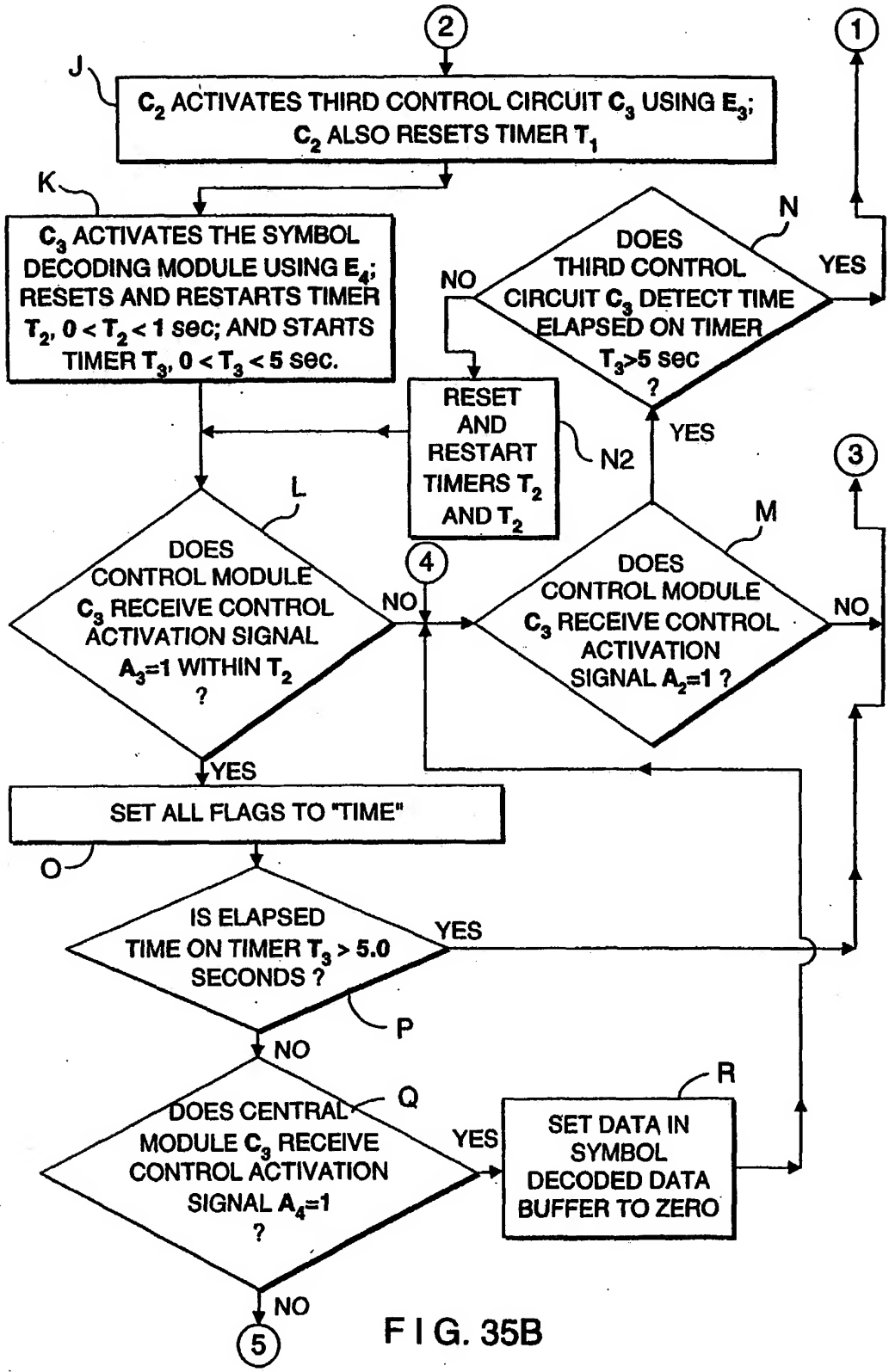

2
1
J
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3; C_2 ALSO RESETS TIMER T_1
K
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4; RESETS AND RESTARTS TIMER T_2, $0 < T_2 < 1$ sec; AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
N
DOES THIRD CONTROL CIRCUIT C_3 DETECT TIME ELAPSED ON TIMER T_3>5 sec ?
YES
NO
RESET AND RESTART TIMERS T_2 AND T_2
N2
YES
3
L
M
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 ?
4
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 ?
NO
YES
SET ALL FLAGS TO "TIME"
O
IS ELAPSED TIME ON TIMER T_3 > 5.0 SECONDS ?
YES
P
NO
R
Q
DOES CENTRAL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_4=1 ?
YES
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
NO
5

FIG. 35B

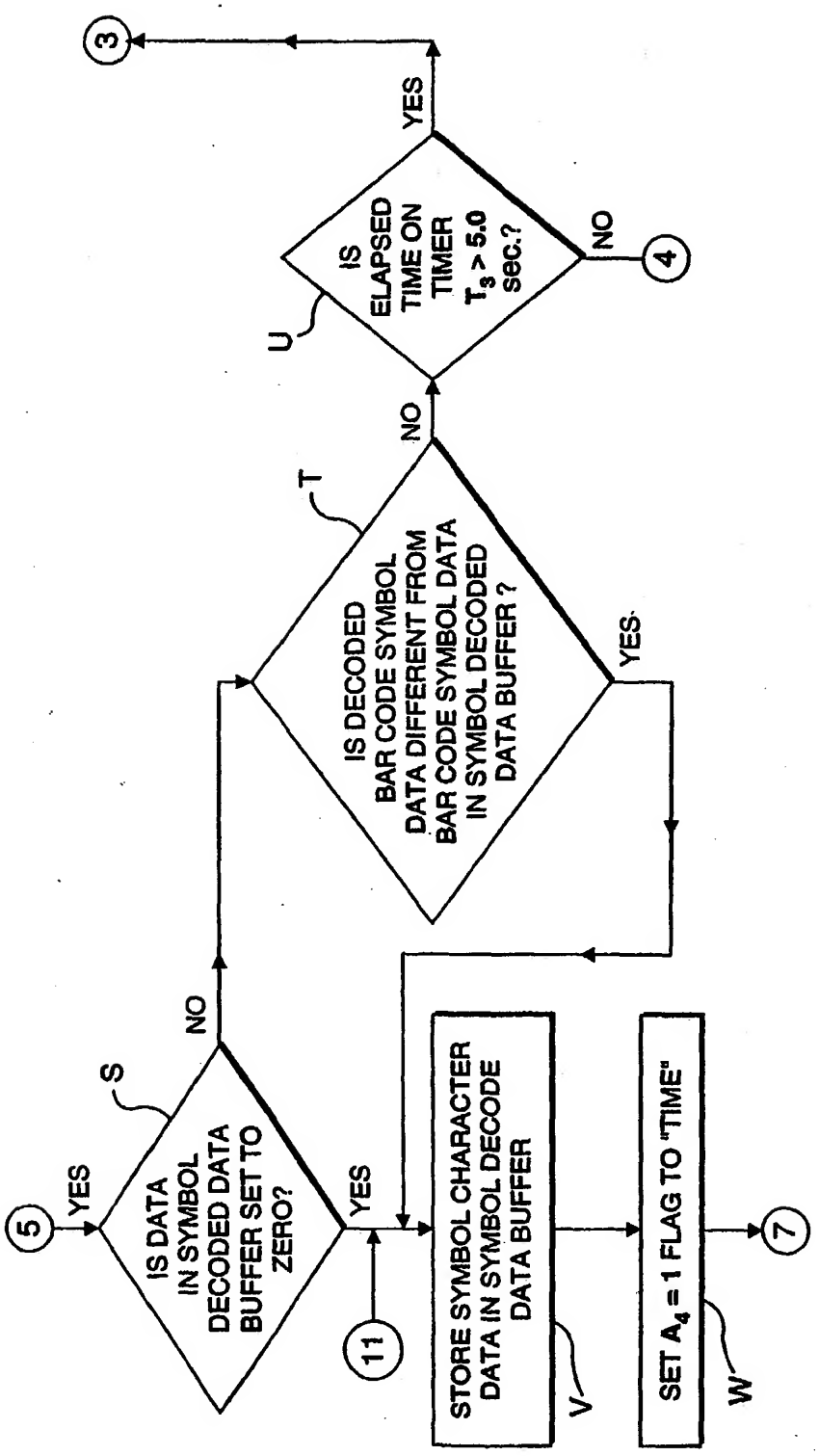

5
YES
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
S
NO
YES
11
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER
V
SET A_4 = 1 FLAG TO "TIME"
W
7
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
T
YES
NO
IS ELAPSED TIME ON TIMER T_3 > 5.0 sec.?
U
YES
NO
3
4

FIG. 35C

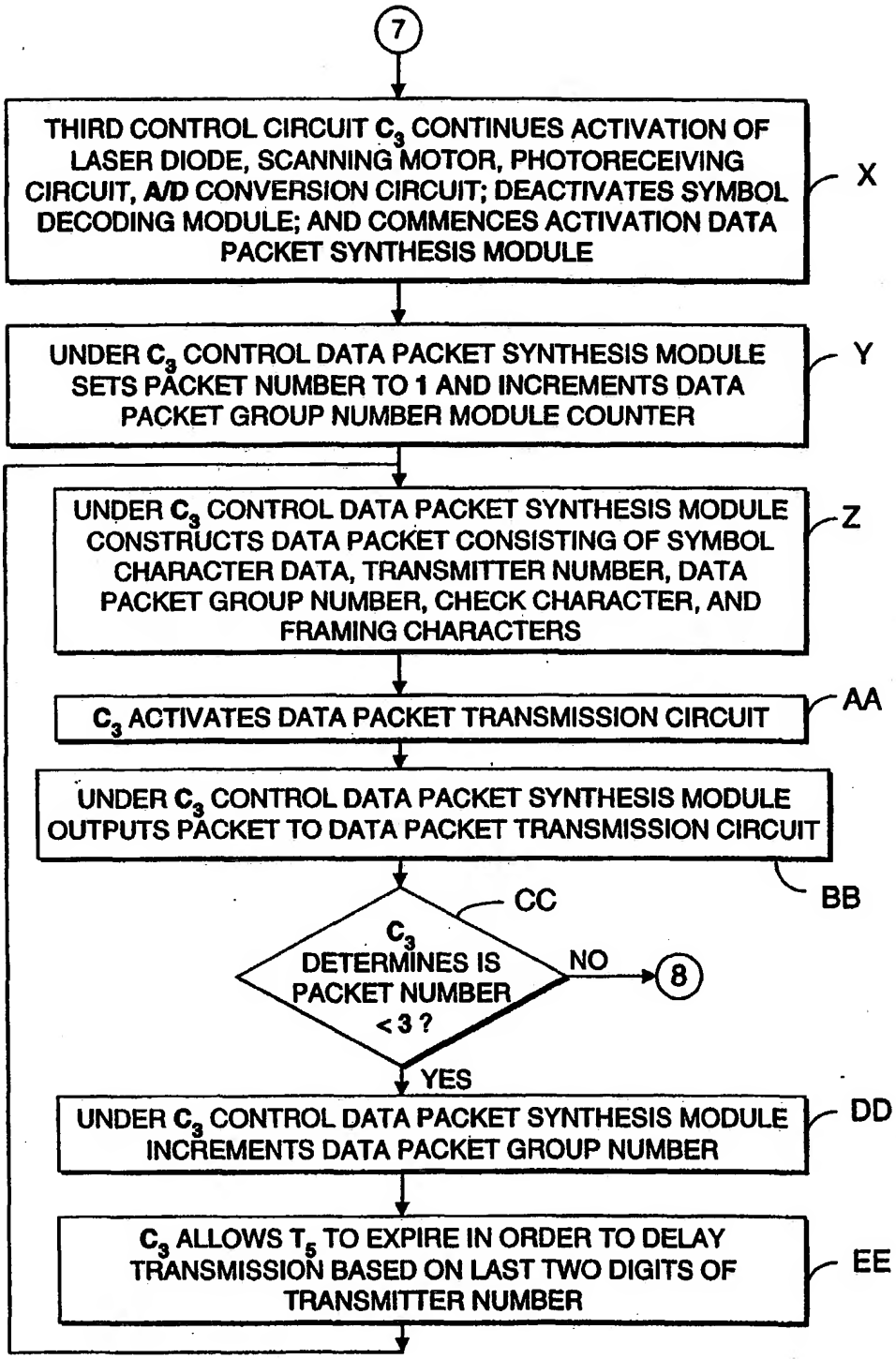

7
THIRD CONTROL CIRCUIT C_3 CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION DATA PACKET SYNTHESIS MODULE
X
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE SETS PACKET NUMBER TO 1 AND INCREMENTS DATA PACKET GROUP NUMBER MODULE COUNTER
Y
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE CONSTRUCTS DATA PACKET CONSISTING OF SYMBOL CHARACTER DATA, TRANSMITTER NUMBER, DATA PACKET GROUP NUMBER, CHECK CHARACTER, AND FRAMING CHARACTERS
Z
C_3 ACTIVATES DATA PACKET TRANSMISSION CIRCUIT
AA
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE OUTPUTS PACKET TO DATA PACKET TRANSMISSION CIRCUIT
BB
CC
C_3 DETERMINES IS PACKET NUMBER < 3 ?
NO
8
YES
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE INCREMENTS DATA PACKET GROUP NUMBER
DD
C_3 ALLOWS T_5 TO EXPIRE IN ORDER TO DELAY TRANSMISSION BASED ON LAST TWO DIGITS OF TRANSMITTER NUMBER
EE

FIG. 35D

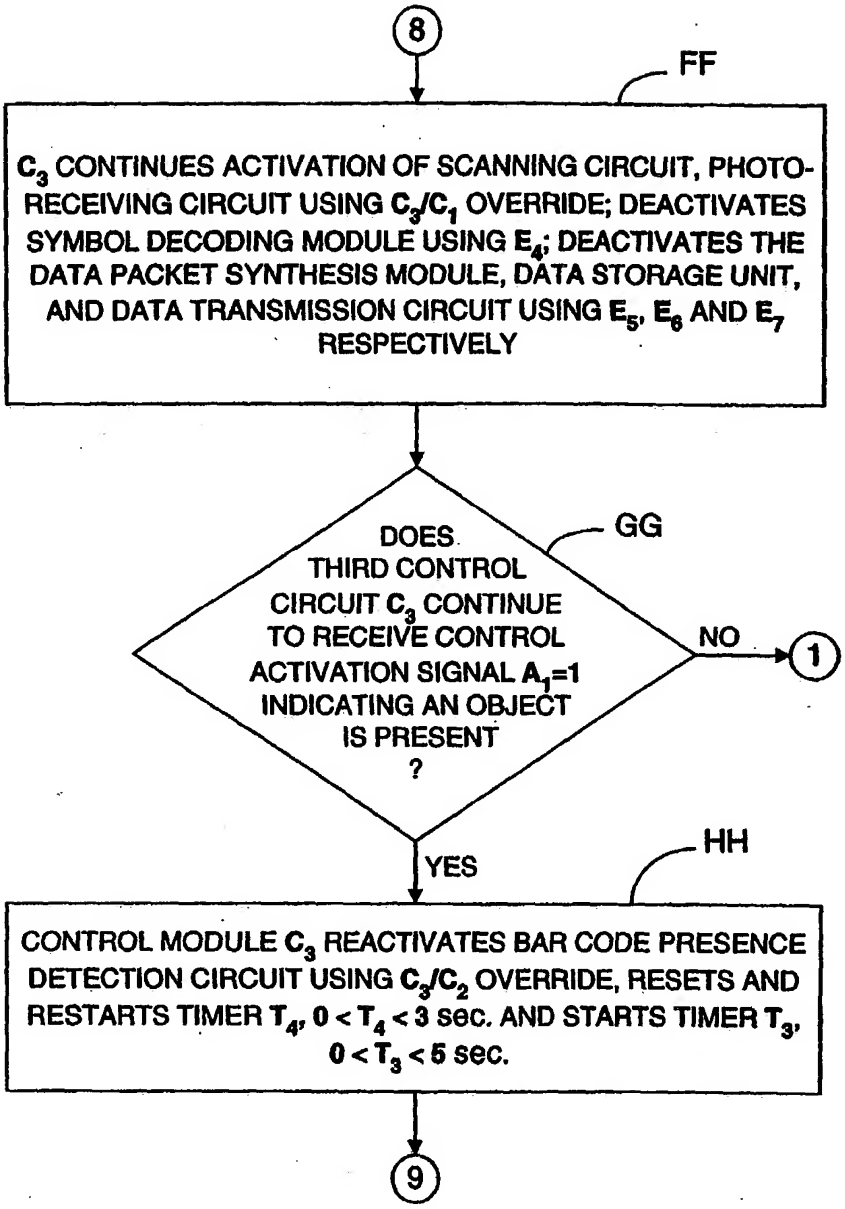

8
FF
C3 CONTINUES ACTIVATION OF SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT USING C3/C1 OVERRIDE; DEACTIVATES SYMBOL DECODING MODULE USING E4; DEACTIVATES THE DATA PACKET SYNTHESIS MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT USING E5, E6 AND E7 RESPECTIVELY
GG
DOES THIRD CONTROL CIRCUIT C3 CONTINUE TO RECEIVE CONTROL ACTIVATION SIGNAL A1=1 INDICATING AN OBJECT IS PRESENT ?
NO
1
YES
HH
CONTROL MODULE C3 REACTIVATES BAR CODE PRESENCE DETECTION CIRCUIT USING C3/C2 OVERRIDE, RESETS AND RESTARTS TIMER T4, 0 < T4 < 3 sec. AND STARTS TIMER T3, 0 < T3 < 5 sec.
9

FIG. 35E

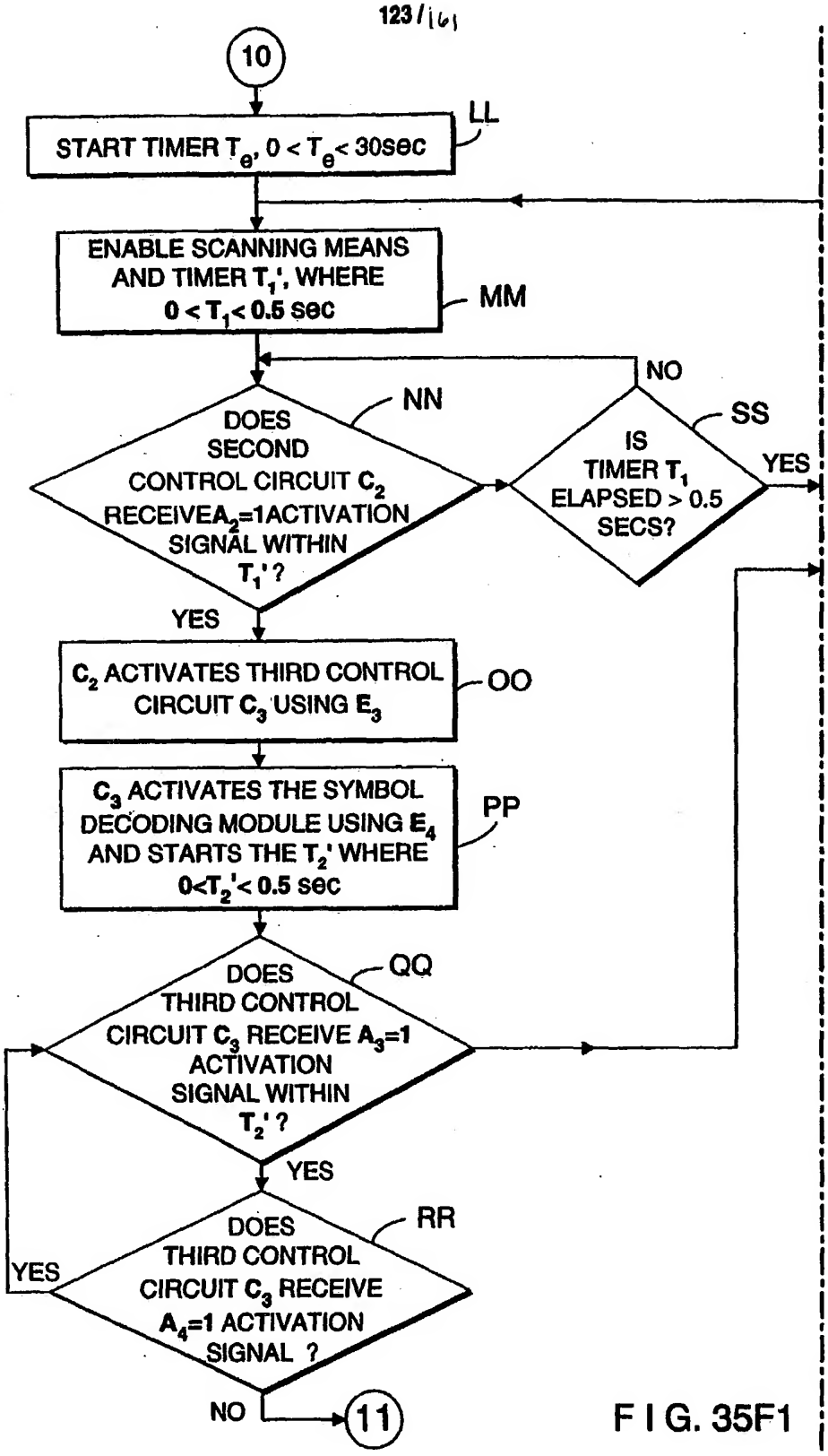

10
START TIMER T_θ, $0 < T_\theta < 30$sec
LL
ENABLE SCANNING MEANS AND TIMER T_1', WHERE $0 < T_1 < 0.5$ sec
MM
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE A_2=1 ACTIVATION SIGNAL WITHIN T_1' ?
NN
NO
IS TIMER T_1 ELAPSED > 0.5 SECS?
SS
YES
YES
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3
OO
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4 AND STARTS THE T_2' WHERE $0 < T_2' < 0.5$ sec
PP
DOES THIRD CONTROL CIRCUIT C_3 RECEIVE A_3=1 ACTIVATION SIGNAL WITHIN T_2' ?
QQ
YES
DOES THIRD CONTROL CIRCUIT C_3 RECEIVE A_4=1 ACTIVATION SIGNAL ?
RR
YES
NO
11

FIG. 35F1

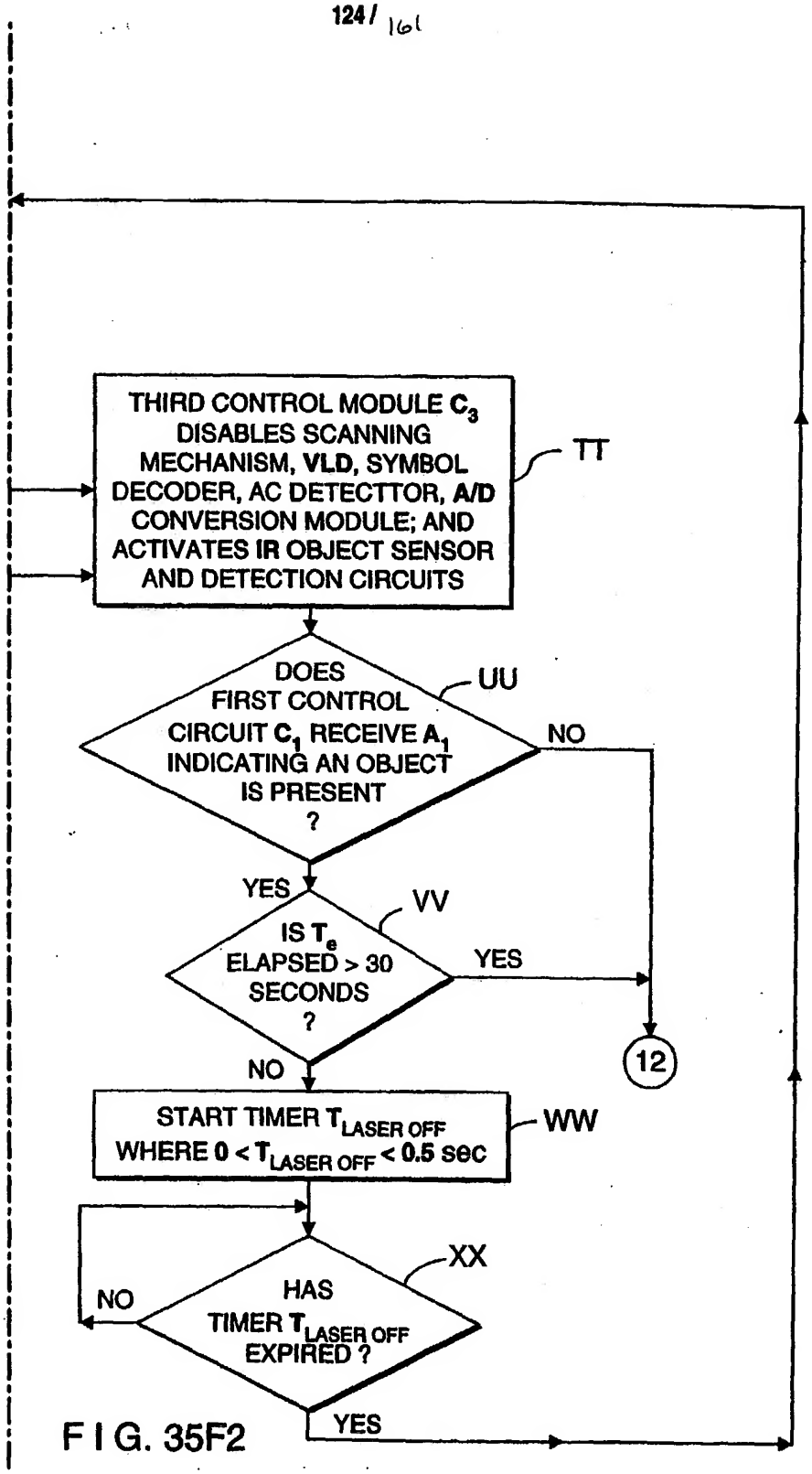

THIRD CONTROL MODULE C_3 DISABLES SCANNING MECHANISM, VLD, SYMBOL DECODER, AC DETECTTOR, A/D CONVERSION MODULE; AND ACTIVATES IR OBJECT SENSOR AND DETECTION CIRCUITS
TT
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE A_1 INDICATING AN OBJECT IS PRESENT ?
UU
NO
YES
IS T_e ELAPSED > 30 SECONDS ?
VV
YES
12
NO
START TIMER $T_{LASER\ OFF}$ WHERE $0 < T_{LASER\ OFF} < 0.5$ sec
WW
HAS TIMER $T_{LASER\ OFF}$ EXPIRED ?
XX
NO
YES

FIG. 35F2

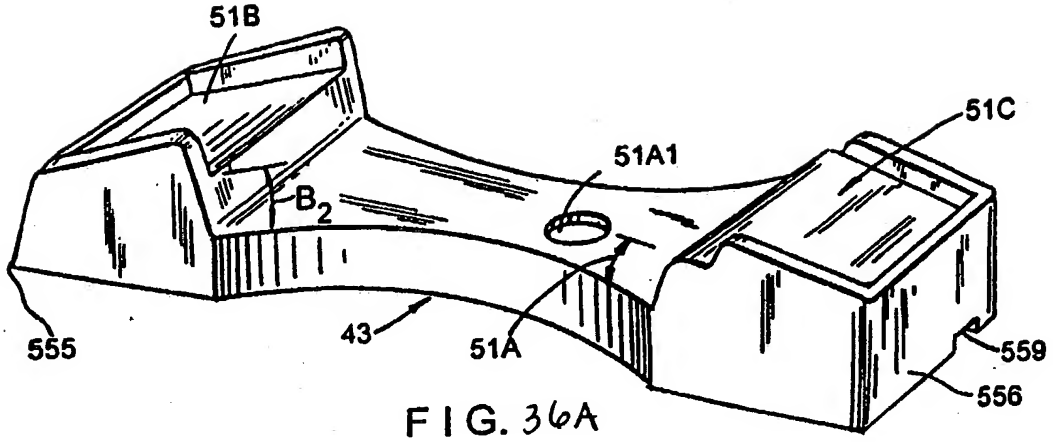


FIG. 36A

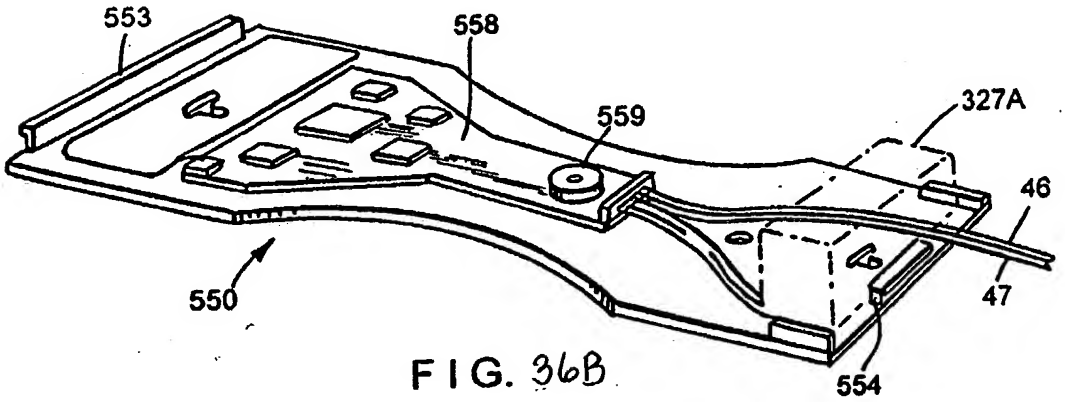


FIG. 36B

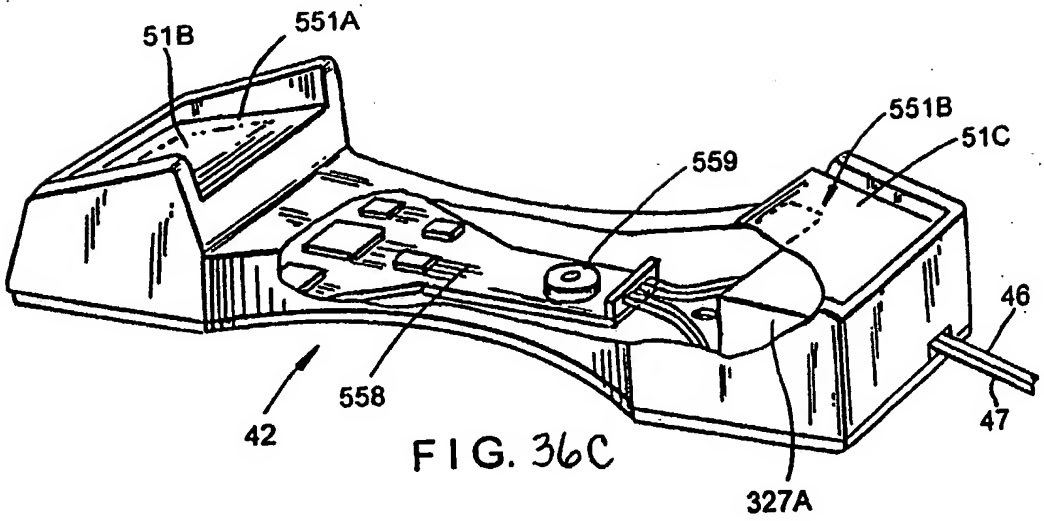


FIG. 36C

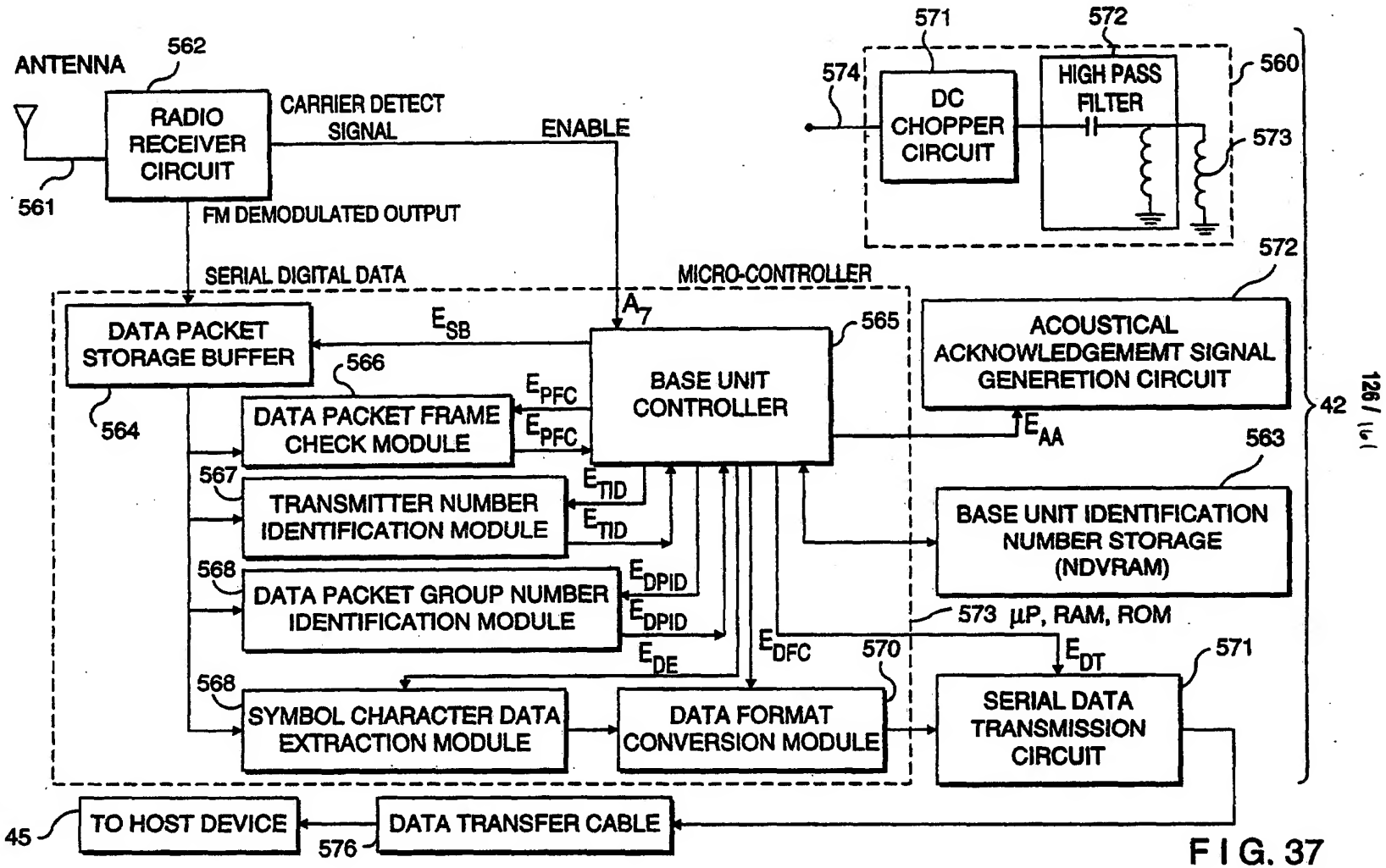

ANTENNA
562
RADIO RECEIVER CIRCUIT
CARRIER DETECT SIGNAL
ENABLE
561
FM DEMODULATED OUTPUT
SERIAL DIGITAL DATA
MICRO-CONTROLLER
571
572
574
DC CHOPPER CIRCUIT
HIGH PASS FILTER
560
573
572
DATA PACKET STORAGE BUFFER
564
E_{SB}
A_7
565
BASE UNIT CONTROLLER
566
E_{PFC}
DATA PACKET FRAME CHECK MODULE
E_{PFC}
ACOUSTICAL ACKNOWLEDGEMEMT SIGNAL GENERETION CIRCUIT
E_{AA}
42
126
567
E_{TID}
TRANSMITTER NUMBER IDENTIFICATION MODULE
E_{TID}
563
BASE UNIT IDENTIFICATION NUMBER STORAGE (NDVRAM)
568
E_{DPID}
DATA PACKET GROUP NUMBER IDENTIFICATION MODULE
E_{DPID}
573 µP, RAM, ROM
E_{DE}
E_{DFC}
570
E_{DT}
571
568
SYMBOL CHARACTER DATA EXTRACTION MODULE
DATA FORMAT CONVERSION MODULE
SERIAL DATA TRANSMISSION CIRCUIT
45
TO HOST DEVICE
576
DATA TRANSFER CABLE

FIG. 37

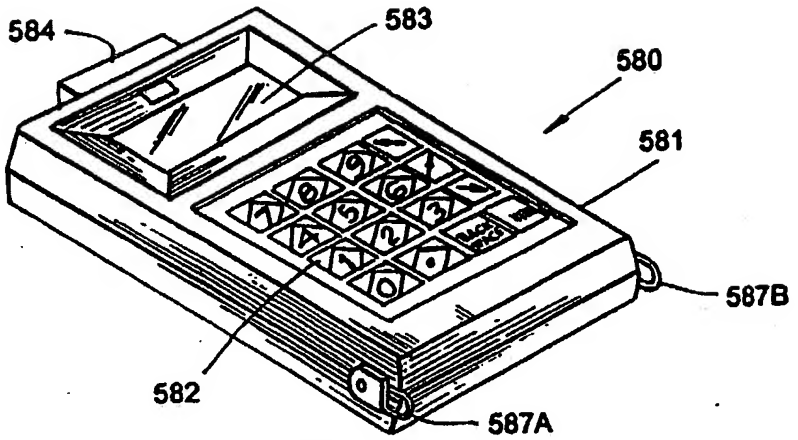


FIG. 38A

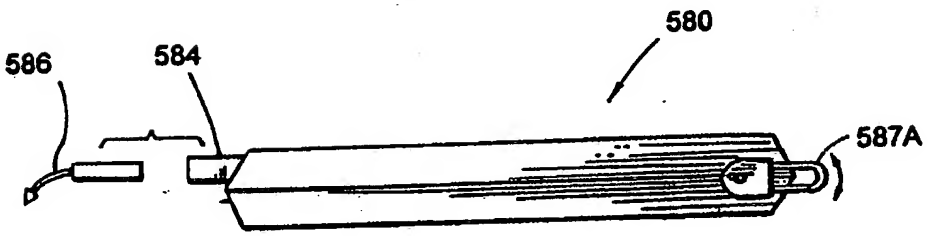


FIG. 38B

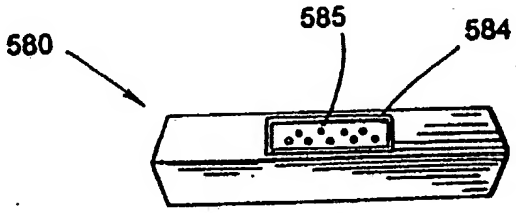


FIG. 38C

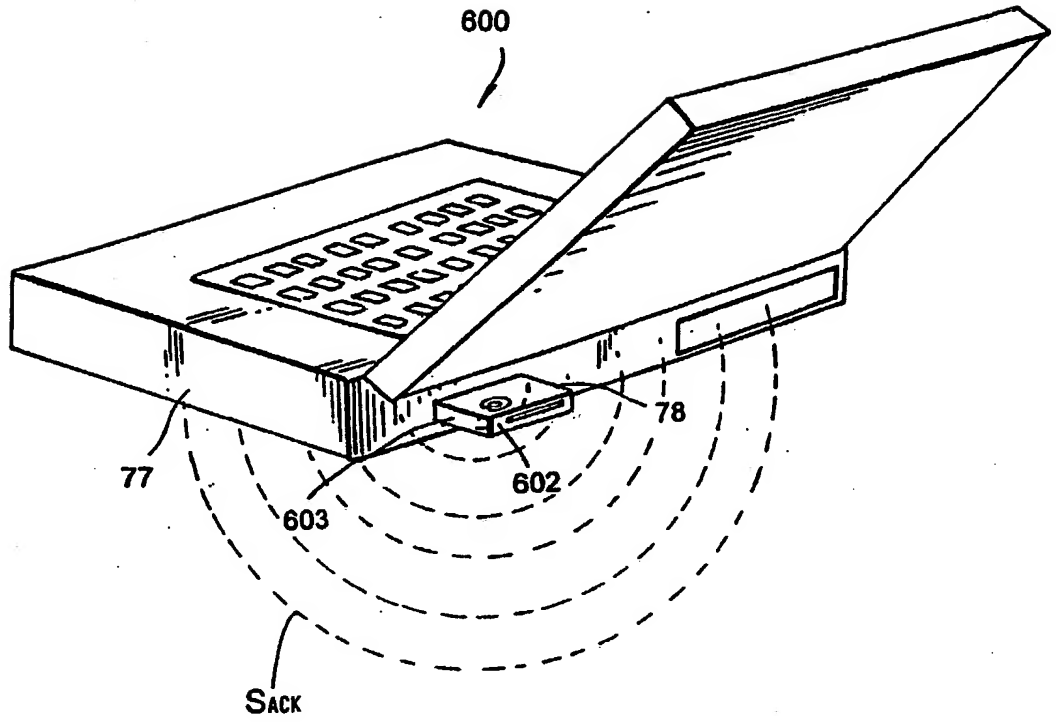


FIG. 39

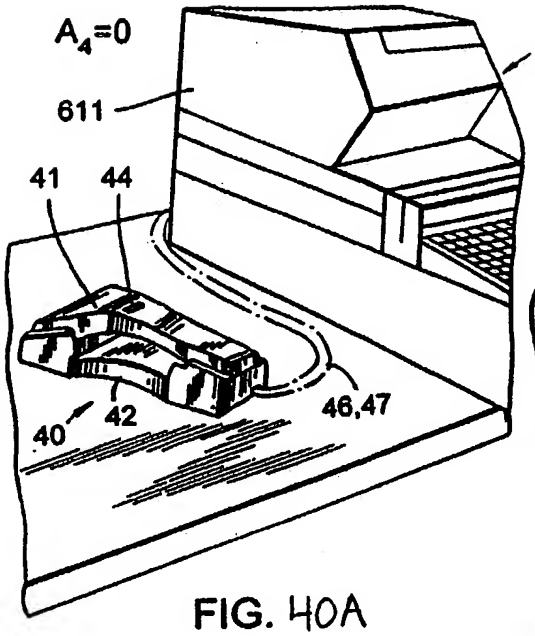


FIG. 40A

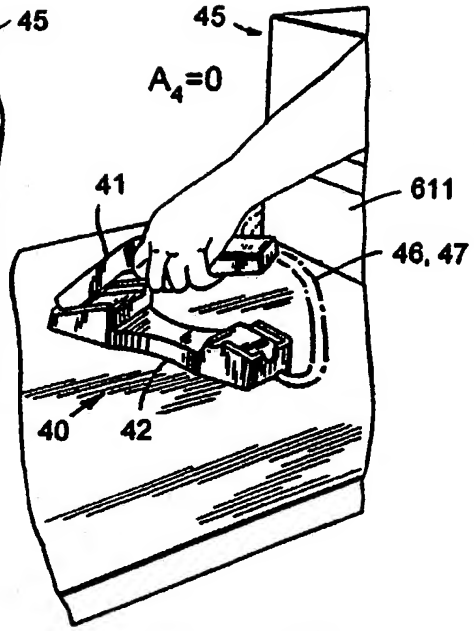


FIG. 40B

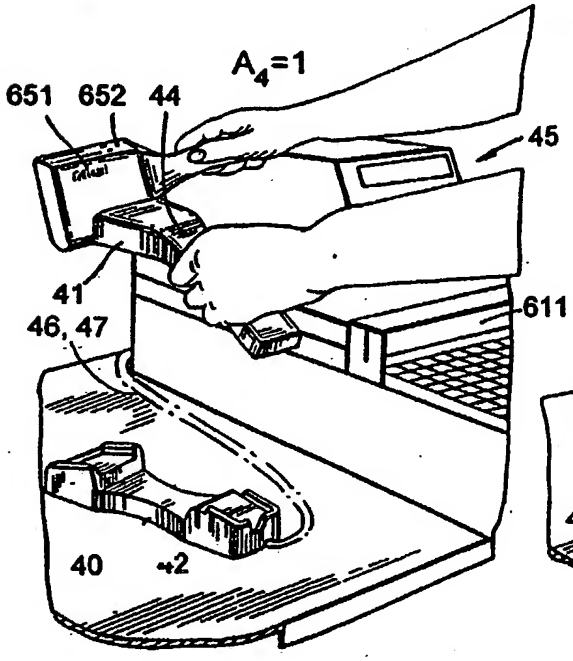


FIG. 40C

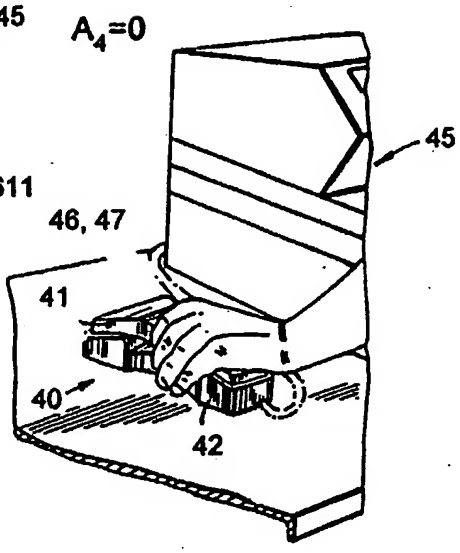


FIG. 40D

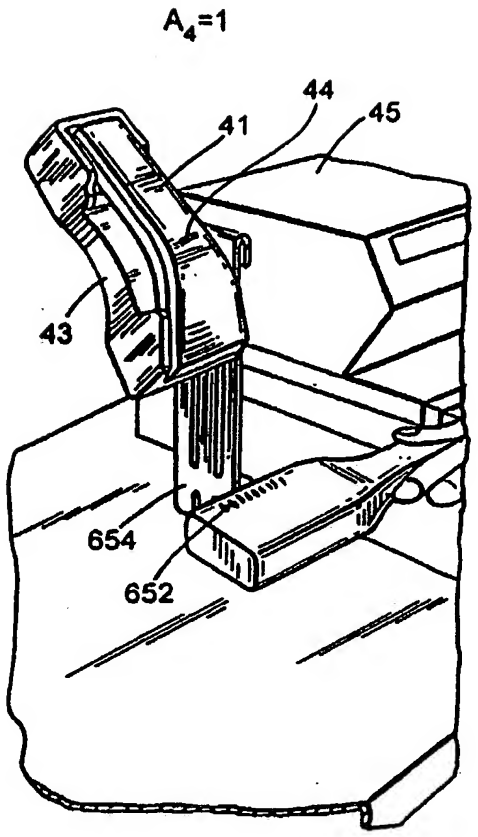


FIG. 41A

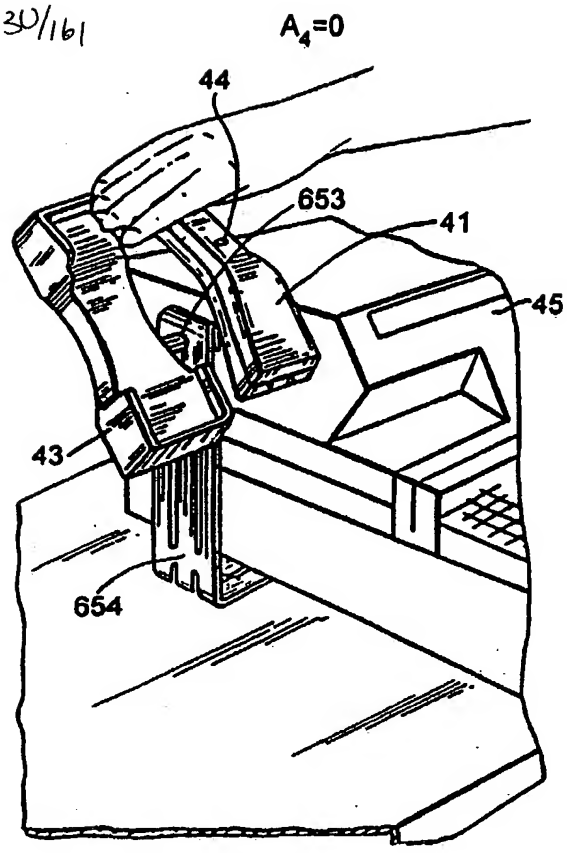


FIG. 41B

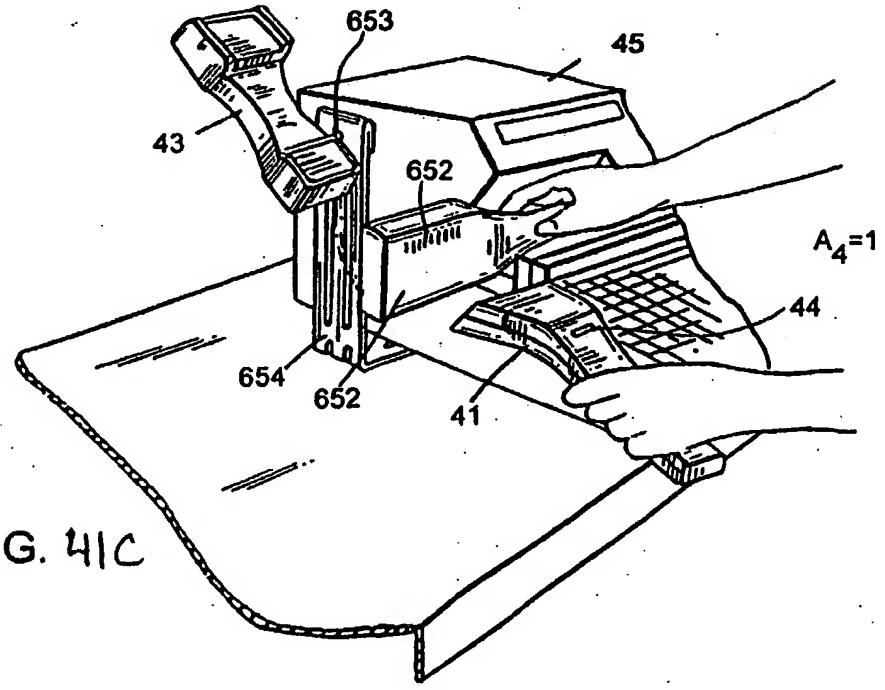


FIG. 41C

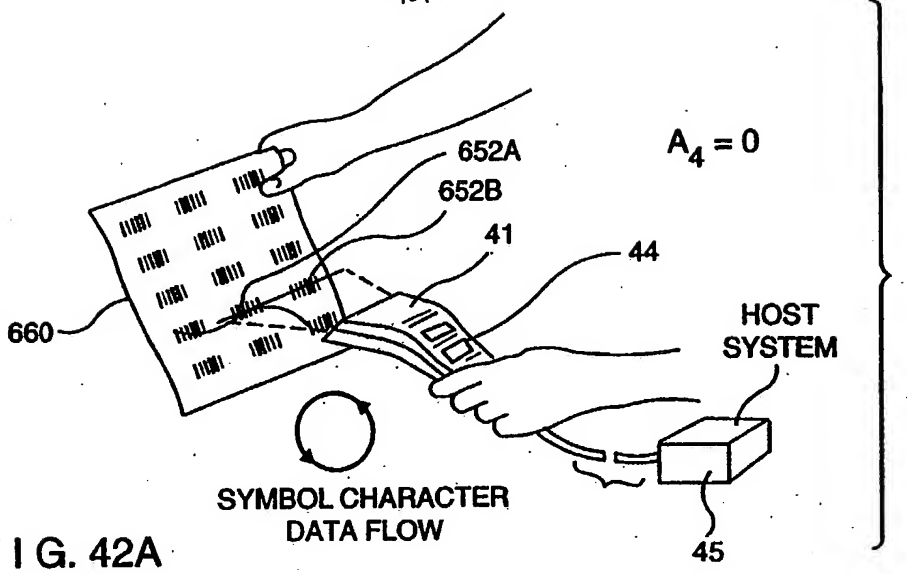


FIG. 42A

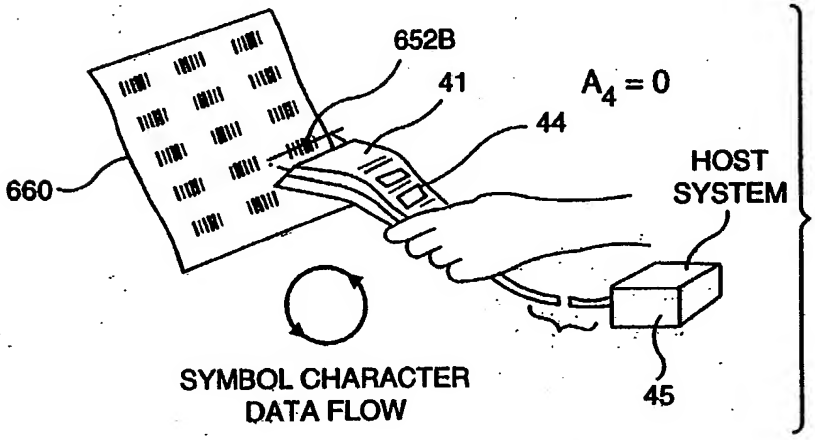


FIG. 42B

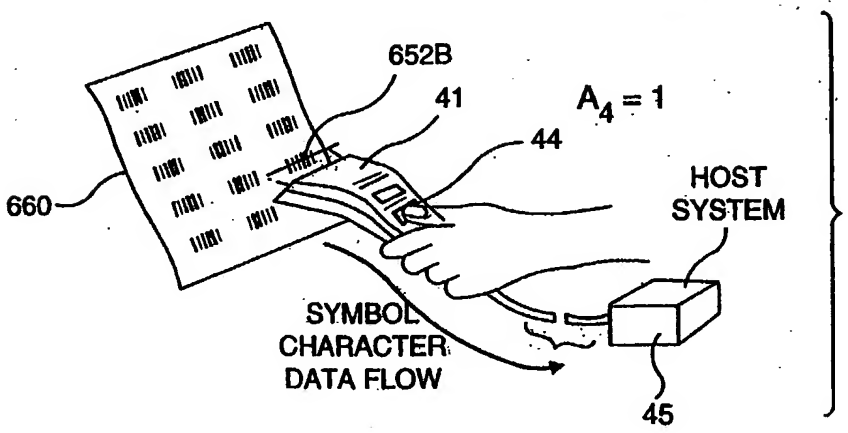
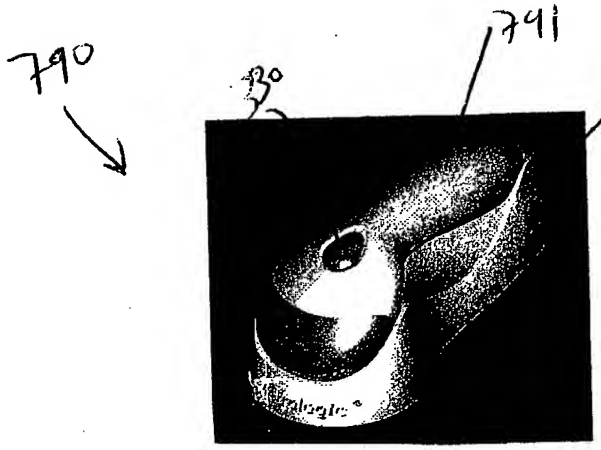


FIG. 42C



Automatic Bar Code Reading System with 2-WAY RF Communication Link

FIG. 43A

FIG. 43B

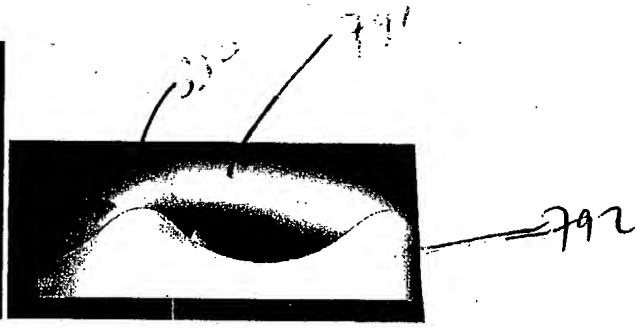


FIG. 43C

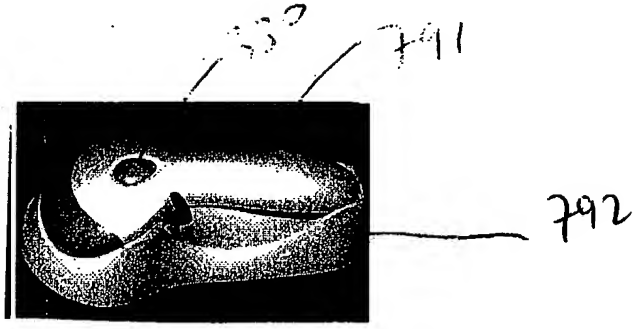


FIG. 43D

Protracted Configuration

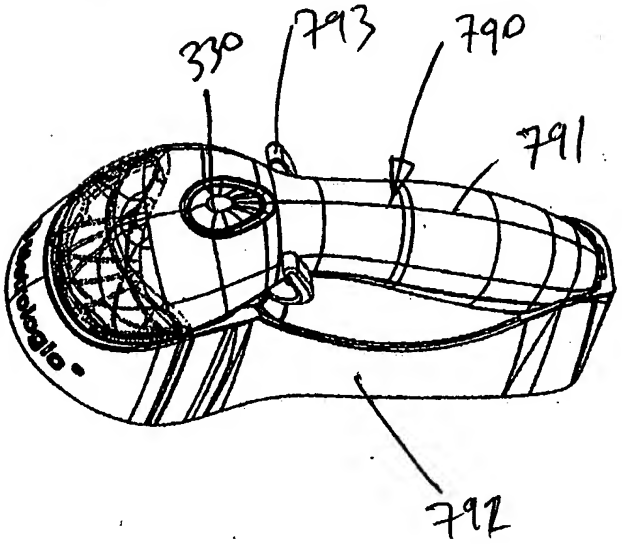


FIG. 43F

Protracted Configuration

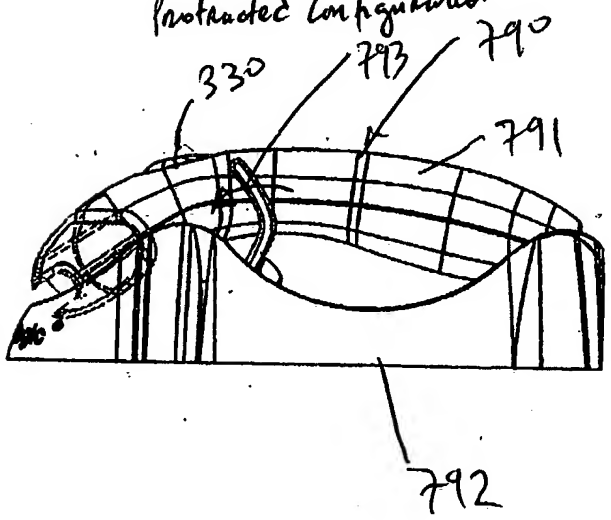


FIG. 43E

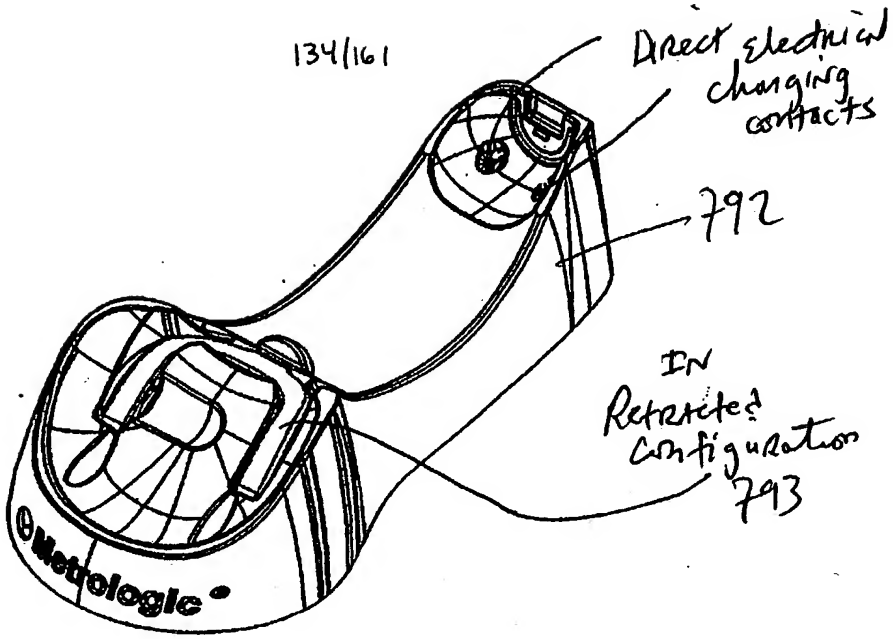


FIG. 43G

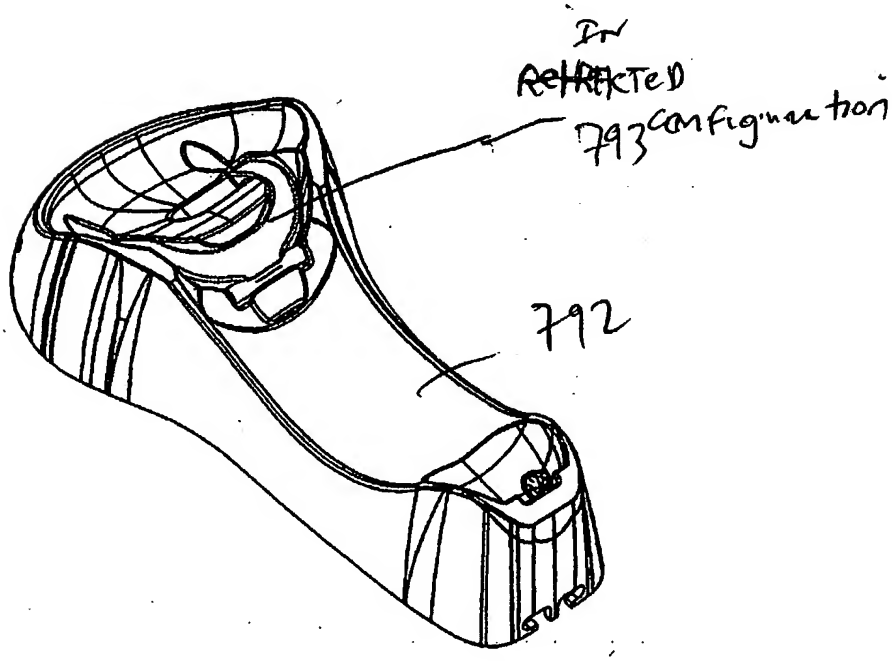


FIG. 43H

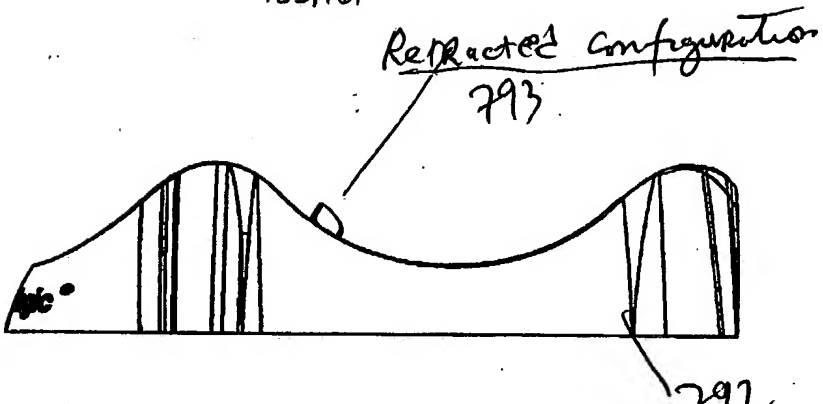


FIG. 43I

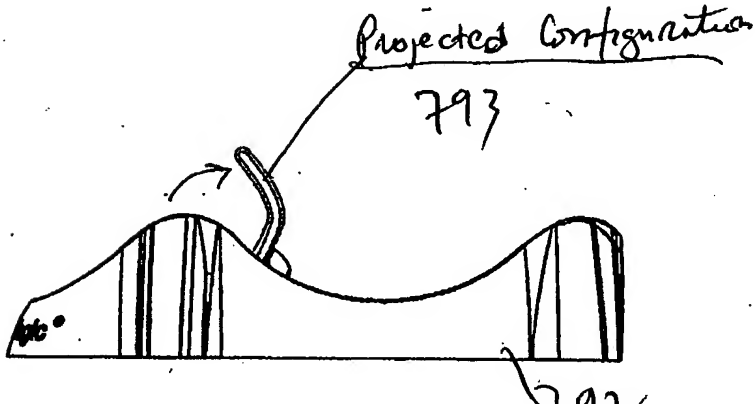


FIG. 43J

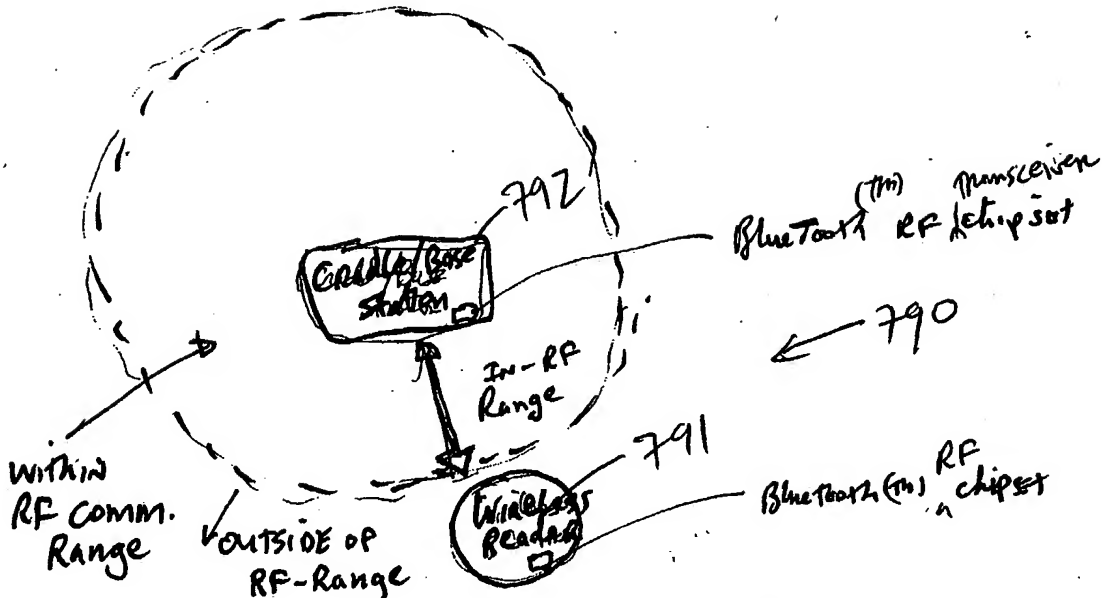


FIG. 44A1

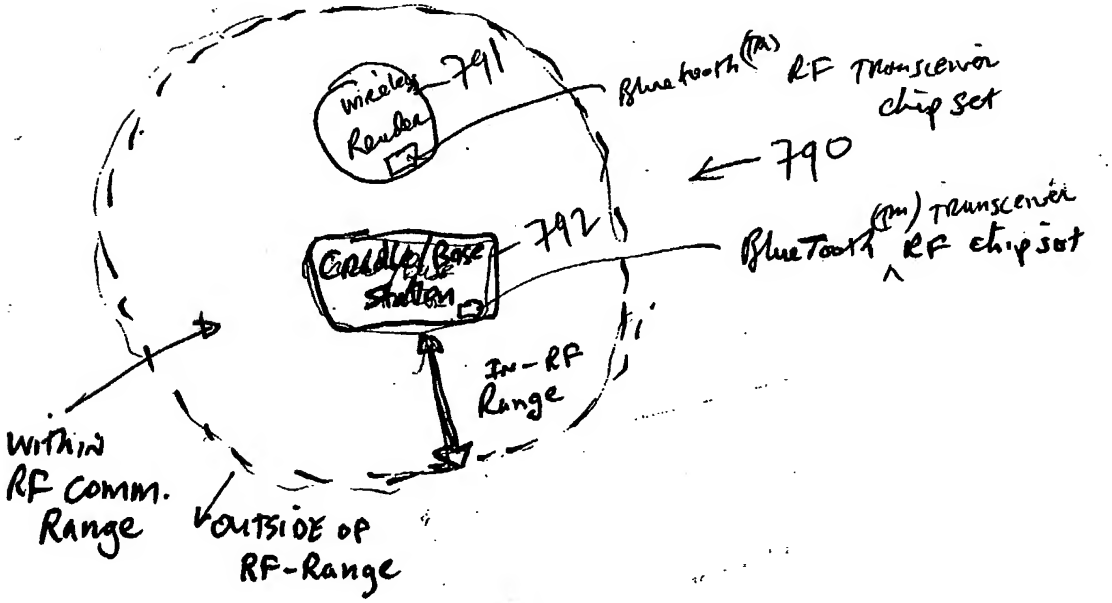


FIG. 44A2

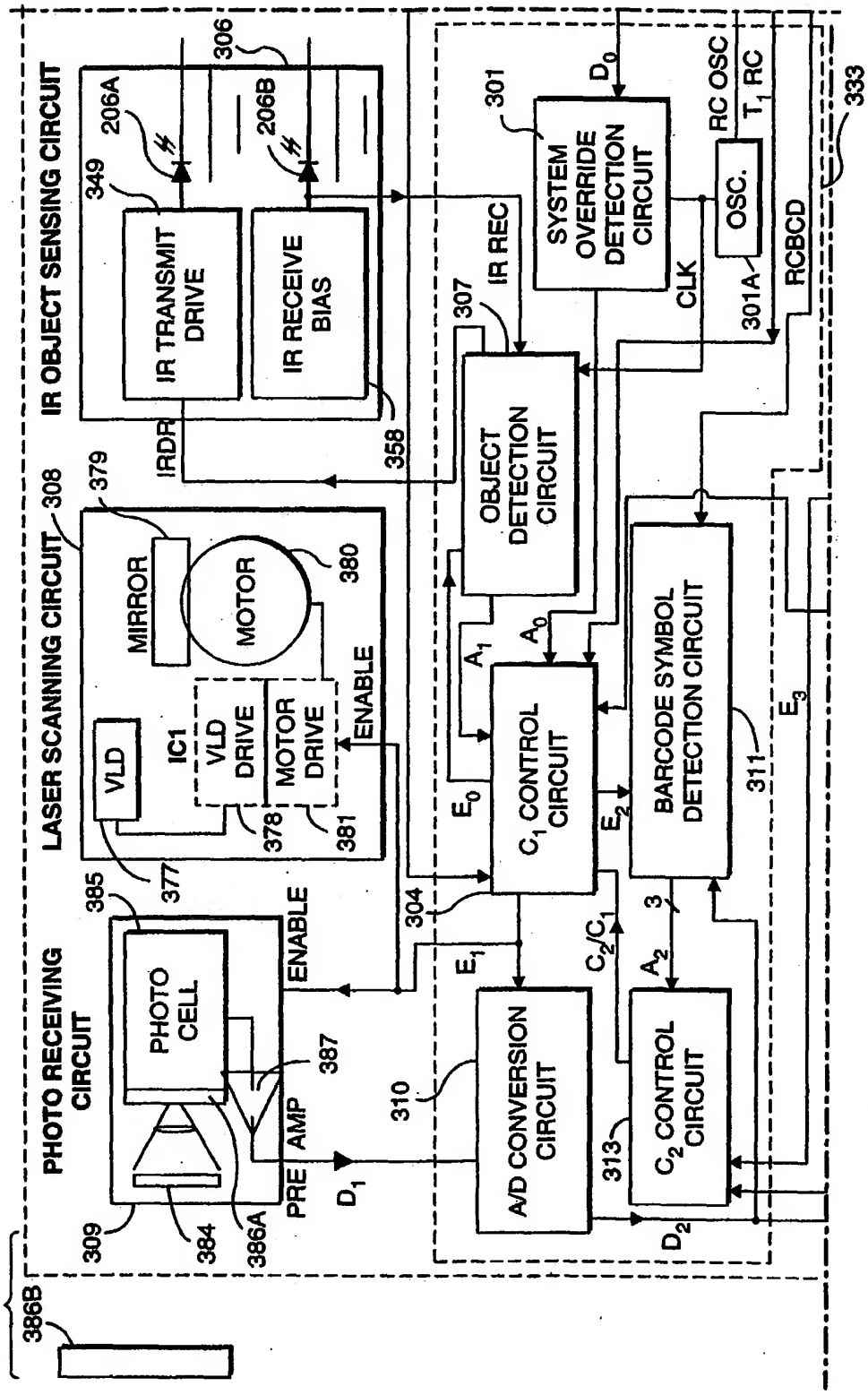


PHOTO RECEIVING CIRCUIT
LASER SCANNING CIRCUIT
IR OBJECT SENSING CIRCUIT
386B
309
384
386A
385
377
PHOTO CELL
ENABLE
387
AMP
PRE
D_1
310
A/D CONVERSION CIRCUIT
304
E_1
C_2/C_1
A_2
3
313
C_2 CONTROL CIRCUIT
D_2
E_0
A_1
A_0
C_1 CONTROL CIRCUIT
E_2
BARCODE SYMBOL DETECTION CIRCUIT
311
E_3
OBJECT DETECTION CIRCUIT
307
IR REC
SYSTEM OVERRIDE DETECTION CIRCUIT
301
D_0
CLK
OSC.
RC OSC
T_1 RC
301A
RCBCD
333
308
379
MIRROR
MOTOR
380
VLD
IC1
VLD DRIVE
MOTOR DRIVE
ENABLE
378
381
IRDR
358
306
206A
206B
349
IR TRANSMIT DRIVE
IR RECEIVE BIAS

FIG 45A1

790

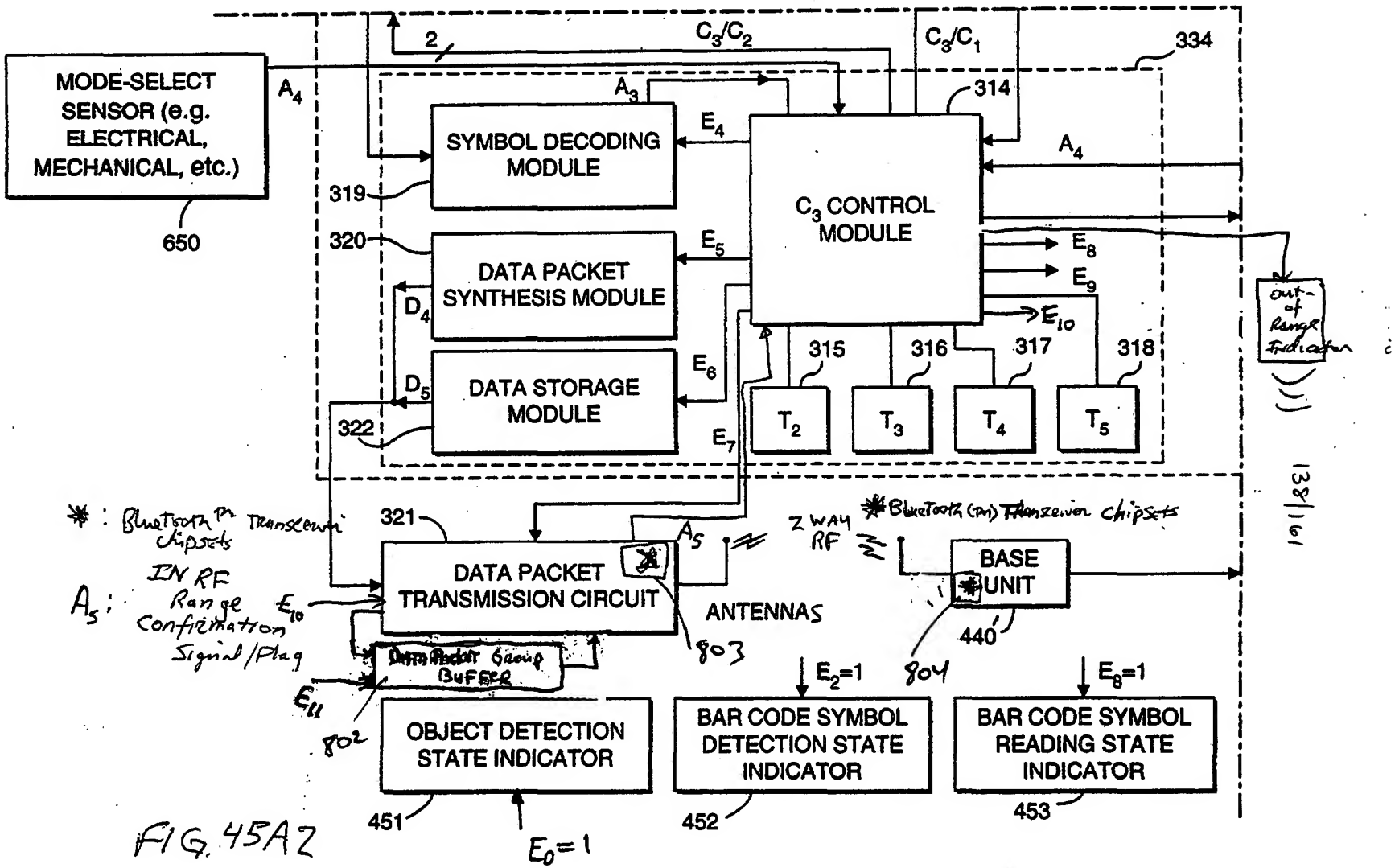

MODE-SELECT SENSOR (e.g. ELECTRICAL, MECHANICAL, etc.)
650
A_4
2
C_3/C_2
C_3/C_1
334
A_3
314
SYMBOL DECODING MODULE
319
E_4
C_3 CONTROL MODULE
A_4
320
DATA PACKET SYNTHESIS MODULE
E_5
D_4
E_8
E_9
E_{10}
out-of-Range Indicator
D_5
DATA STORAGE MODULE
322
E_6
E_7
315
316
317
318
T_2
T_3
T_4
T_5
138/161
* : Bluetooth Transceiver Chipsets
A_5: IN RF Range confirmation Signal/Flag
321
DATA PACKET TRANSMISSION CIRCUIT
A_5
E_{10}
E_{11}
802
803
ANTENNAS
2 WAY RF
* Bluetooth (TM) Transceiver Chipsets
BASE UNIT
440
804
$E_2=1$
$E_8=1$
OBJECT DETECTION STATE INDICATOR
BAR CODE SYMBOL DETECTION STATE INDICATOR
BAR CODE SYMBOL READING STATE INDICATOR
451
452
453
$E_0=1$

FIG. 45A2

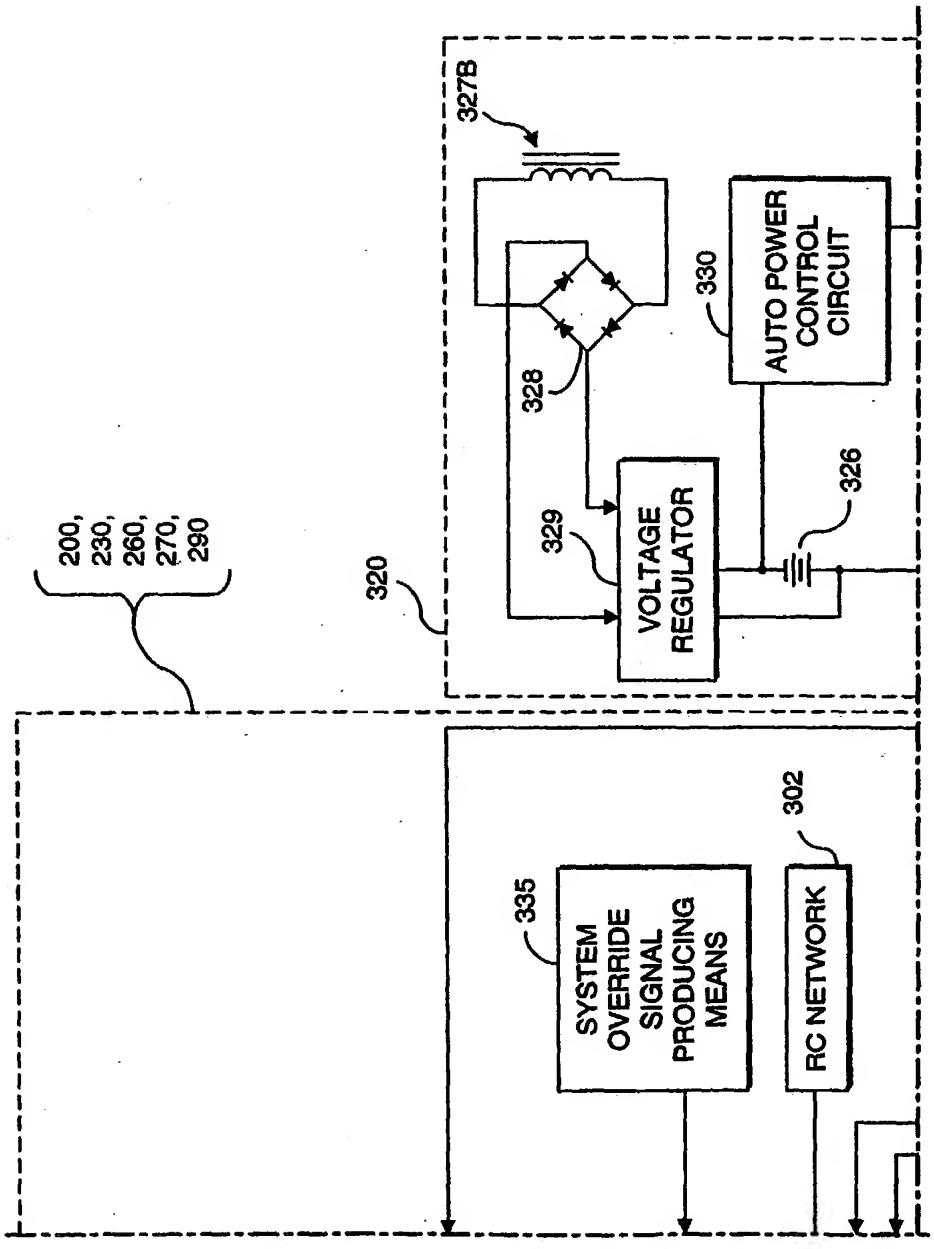

200, 230, 260, 270, 290
320
327B
328
329
330
326
VOLTAGE REGULATOR
AUTO POWER CONTROL CIRCUIT
335
SYSTEM OVERRIDE SIGNAL PRODUCING MEANS
302
RC NETWORK

FIG. 45A3

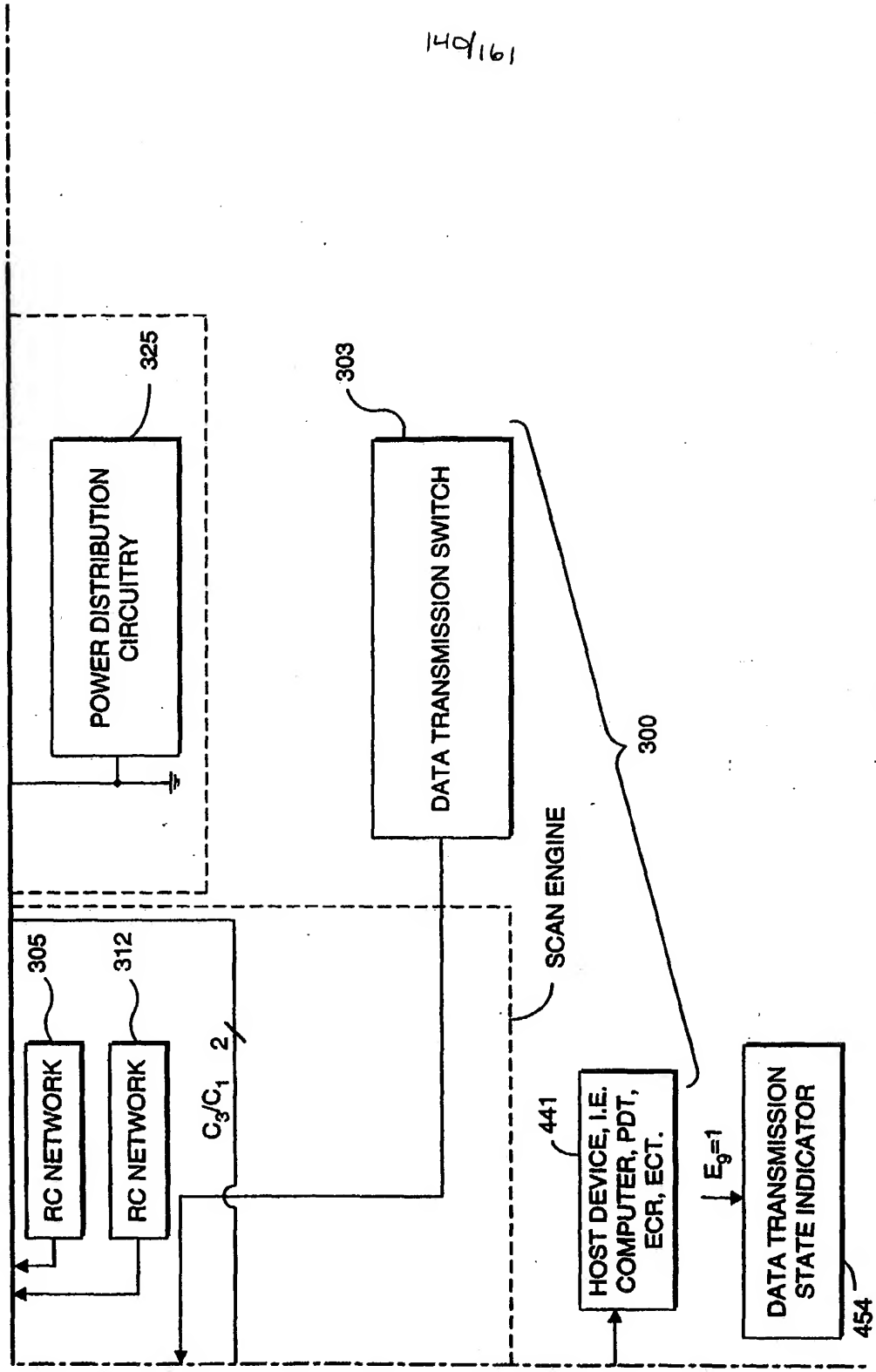

325
POWER DISTRIBUTION CIRCUITRY
303
DATA TRANSMISSION SWITCH
300
SCAN ENGINE
305
RC NETWORK
312
RC NETWORK
C_3/C_1 2
441
HOST DEVICE, I.E. COMPUTER, PDT, ECR, ECT.
E_g=1
DATA TRANSMISSION STATE INDICATOR
454

FIG. 45A4

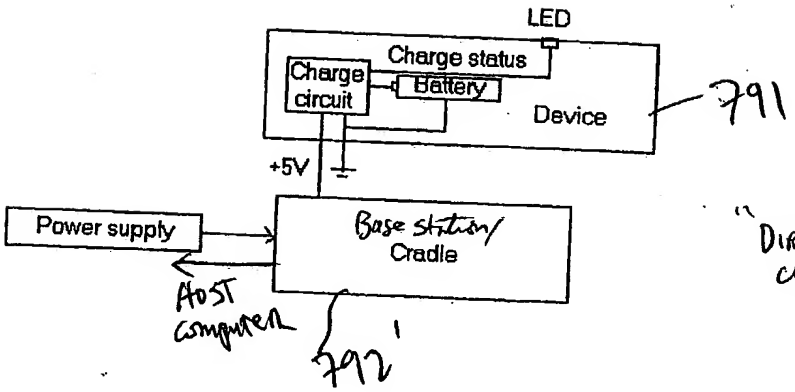

LED
Charge status
Charge circuit
Battery
Device
791
+5V
Power supply
Base station/ Cradle
HOST computer
792'
"Direct-Contact" charge Technique b

FIG. 45B

DATA Packet Transmission VIA 2-WAY RF WITH Automatic RP-Range Dependent Control

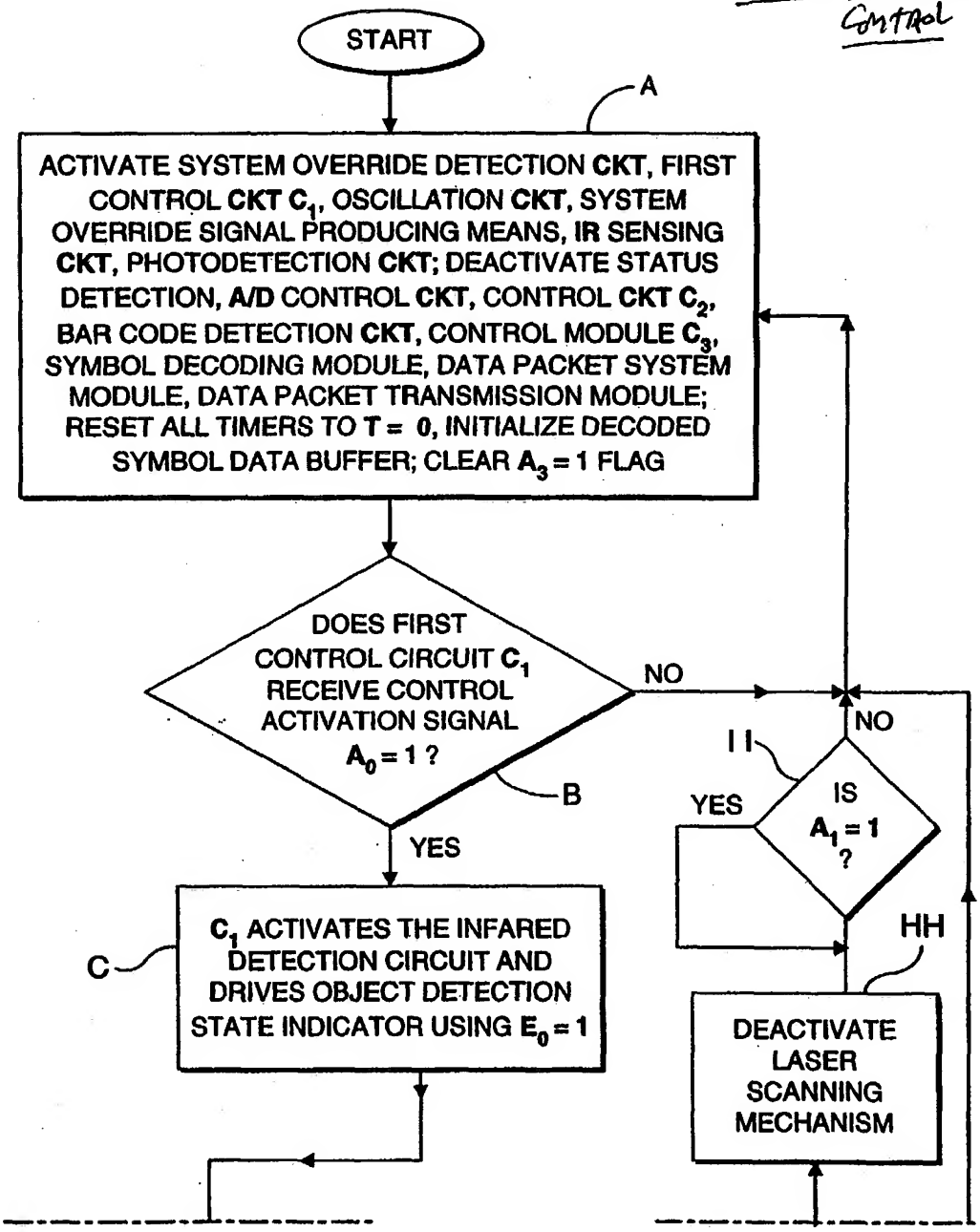


FIG.46A1

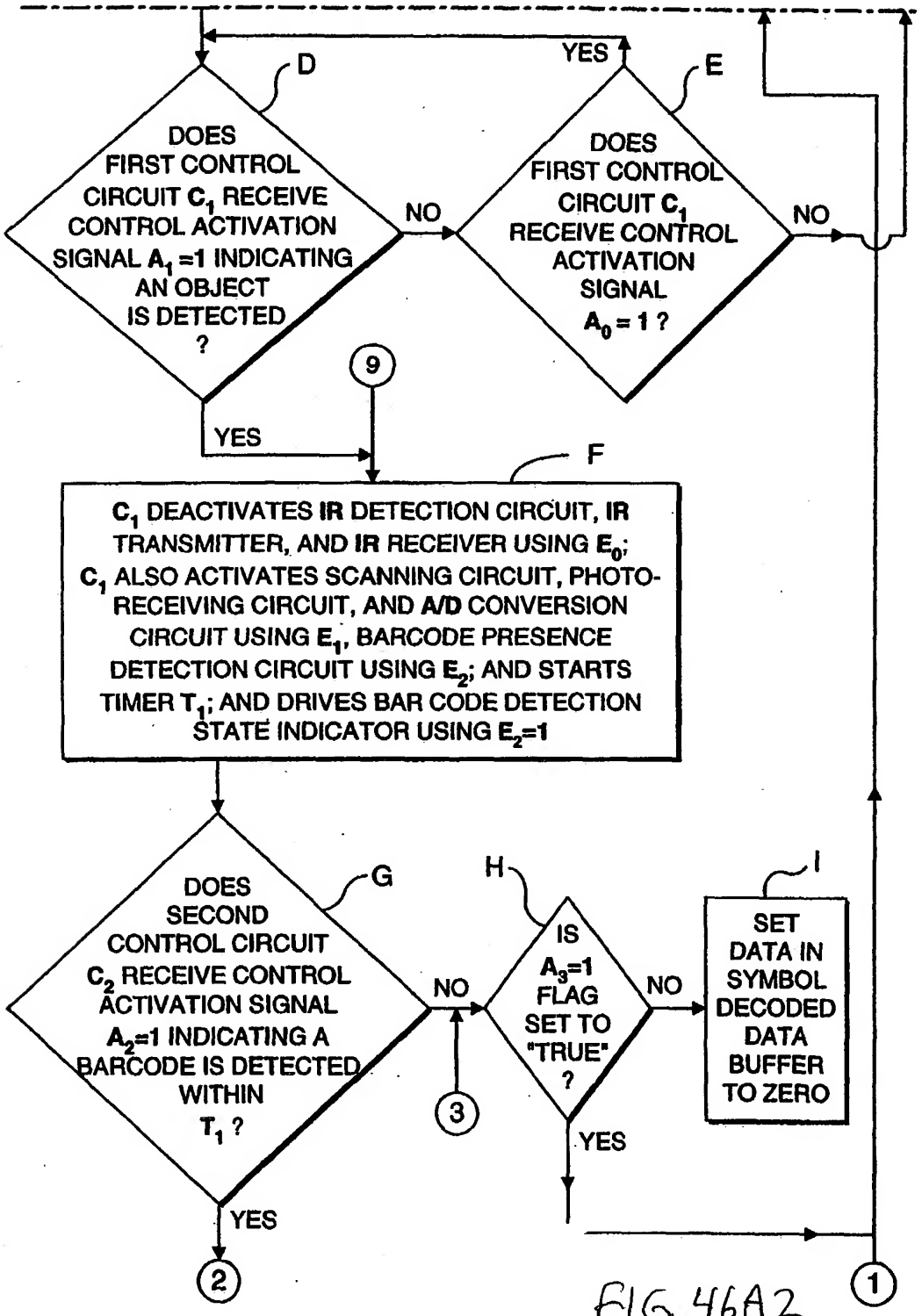

D
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_1 =1 INDICATING AN OBJECT IS DETECTED ?
NO
YES
E
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
NO
YES
9
F
C_1 DEACTIVATES IR DETECTION CIRCUIT, IR TRANSMITTER, AND IR RECEIVER USING E_0; C_1 ALSO ACTIVATES SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT, AND A/D CONVERSION CIRCUIT USING E_1, BARCODE PRESENCE DETECTION CIRCUIT USING E_2; AND STARTS TIMER T_1; AND DRIVES BAR CODE DETECTION STATE INDICATOR USING E_2=1
G
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 INDICATING A BARCODE IS DETECTED WITHIN T_1 ?
NO
YES
H
IS A_3=1 FLAG SET TO "TRUE" ?
NO
YES
I
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
3
2
1

FIG 46A2

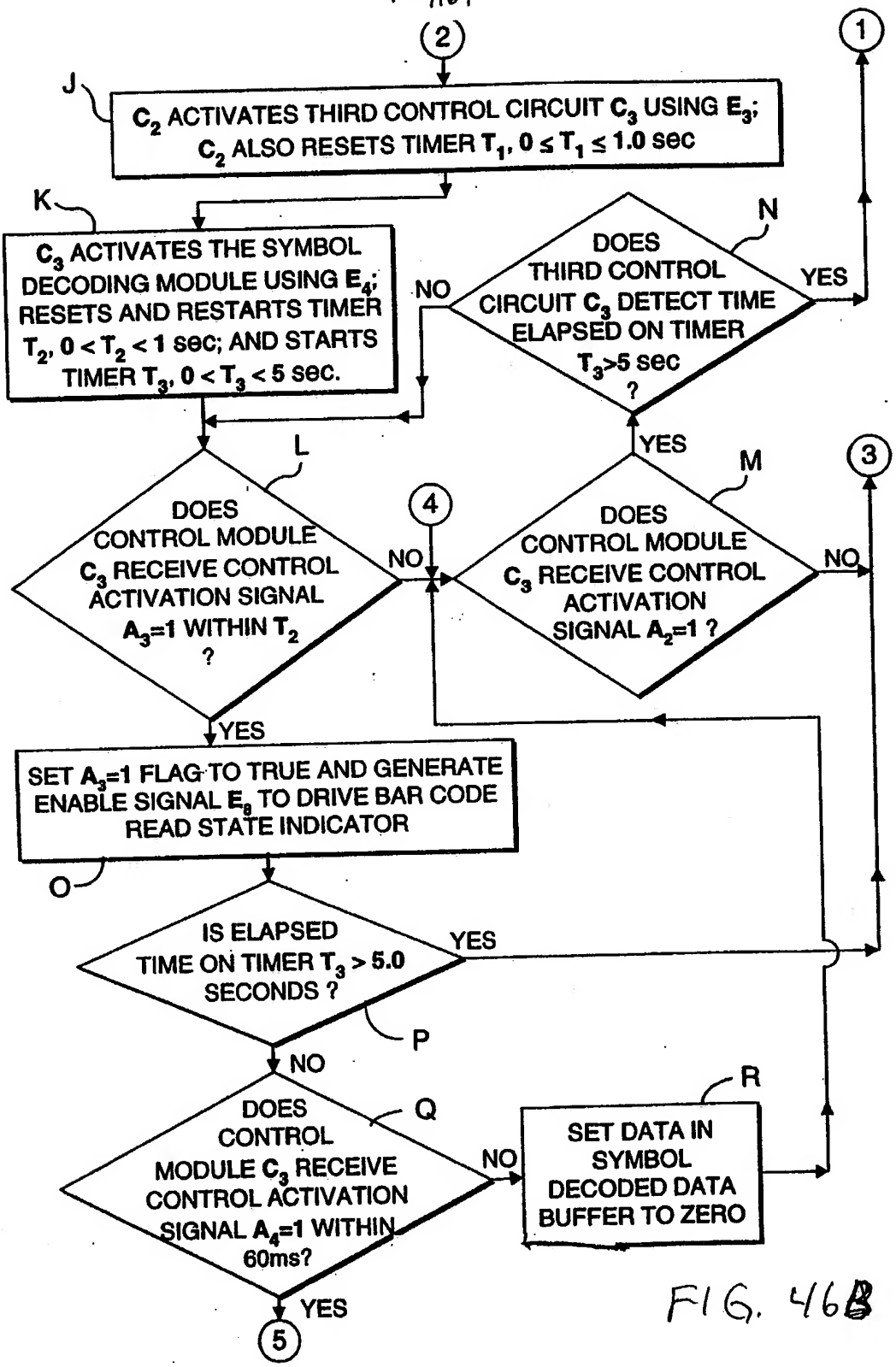

2
1
J
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3; C_2 ALSO RESETS TIMER T_1, $0 \leq T_1 \leq 1.0$ sec
K
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4; RESETS AND RESTARTS TIMER T_2, $0 < T_2 < 1$ sec; AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
N
DOES THIRD CONTROL CIRCUIT C_3 DETECT TIME ELAPSED ON TIMER T_3>5 sec ?
NO
YES
YES
L
M
3
4
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 ?
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 ?
NO
YES
SET A_3=1 FLAG TO TRUE AND GENERATE ENABLE SIGNAL E_8 TO DRIVE BAR CODE READ STATE INDICATOR
O
IS ELAPSED TIME ON TIMER T_3 > 5.0 SECONDS ?
YES
P
NO
R
Q
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_4=1 WITHIN 60ms?
NO
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
YES
5

FIG. 46B

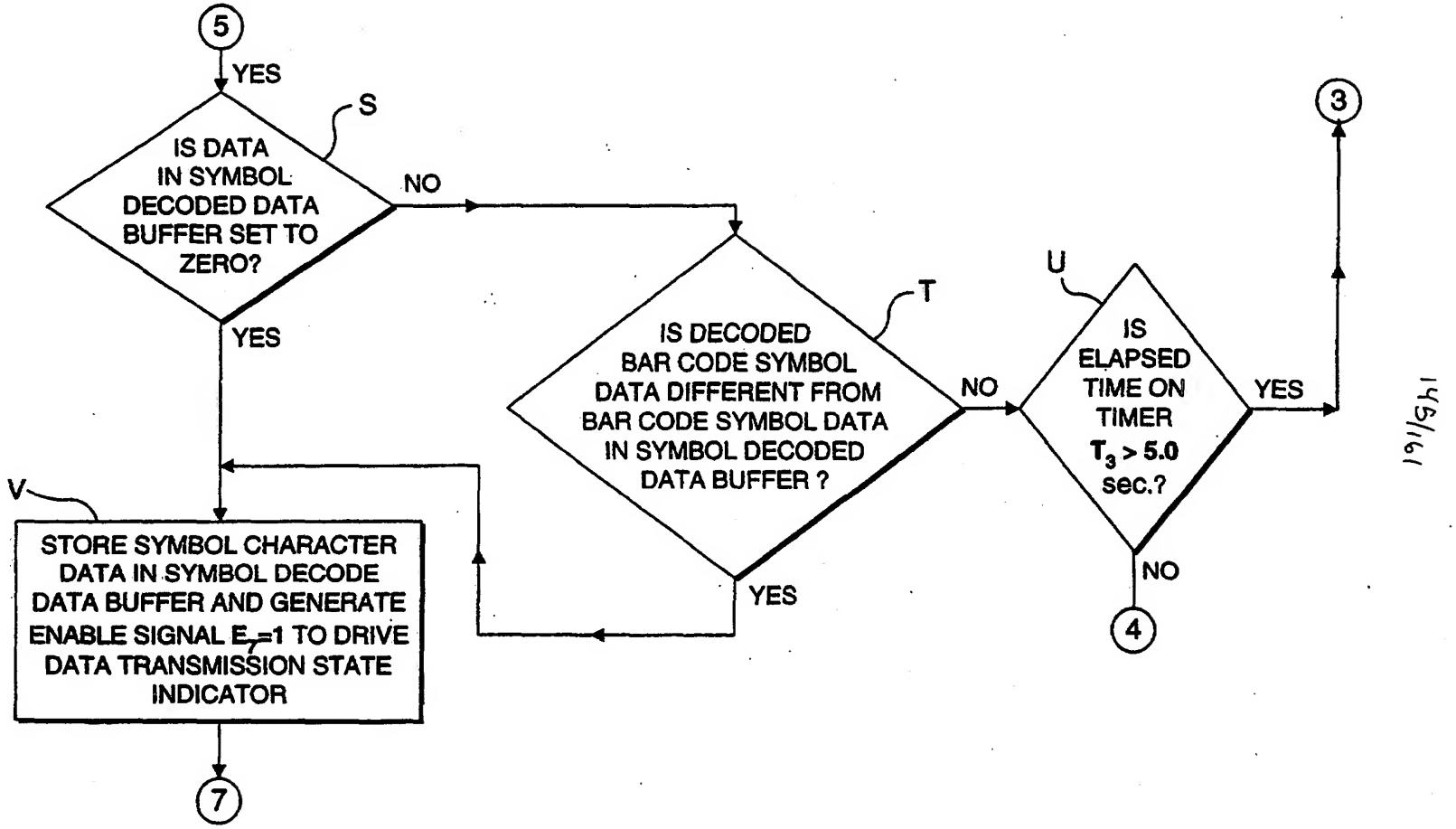

5
YES
S
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
NO
YES
T
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
NO
U
IS ELAPSED TIME ON TIMER $T_3 > 5.0$ sec.?
YES
3
NO
4
YES
V
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER AND GENERATE ENABLE SIGNAL E_7=1 TO DRIVE DATA TRANSMISSION STATE INDICATOR
7

FIG 46C1

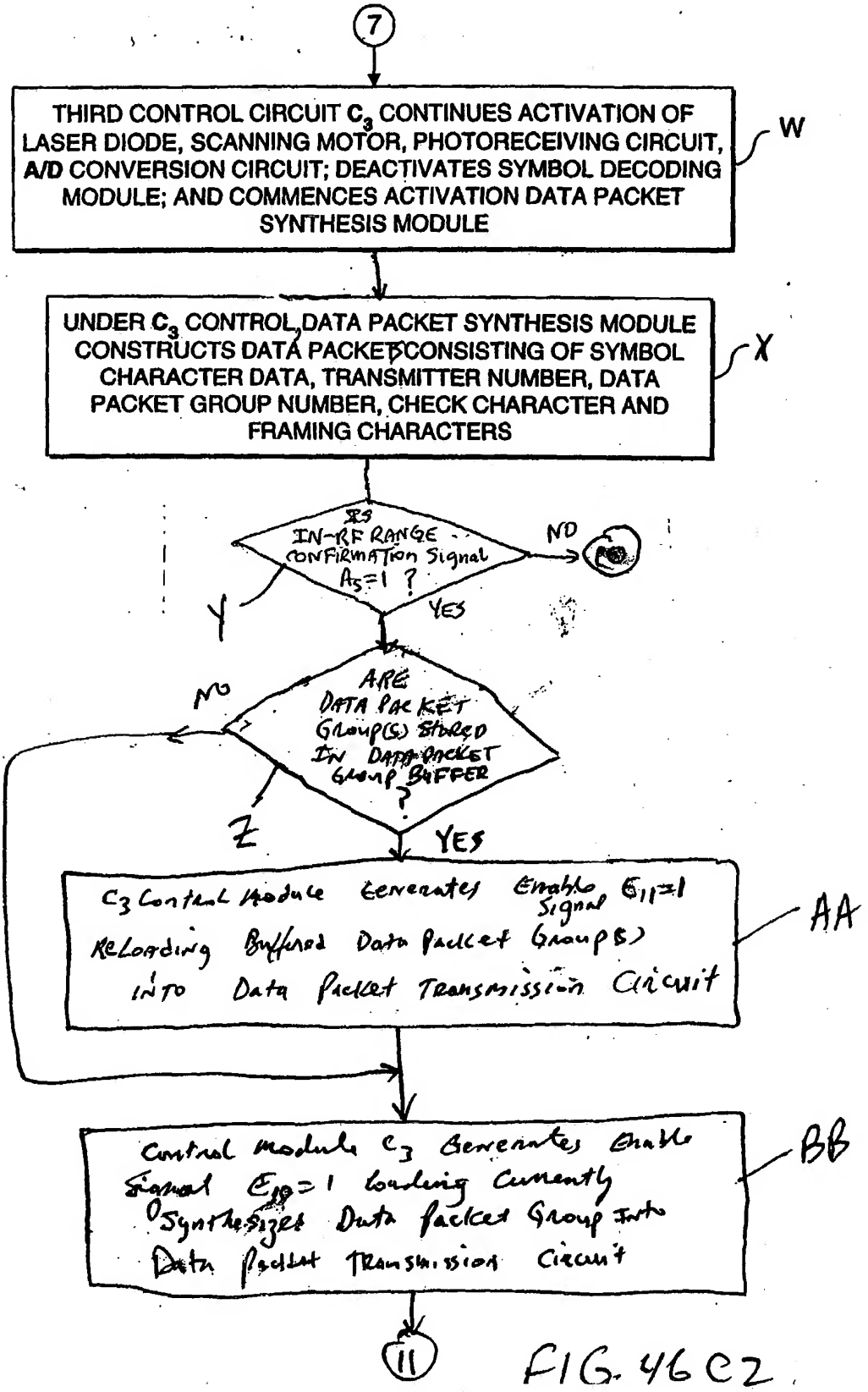

7
THIRD CONTROL CIRCUIT C_3 CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION DATA PACKET SYNTHESIS MODULE
W
UNDER C_3 CONTROL, DATA PACKET SYNTHESIS MODULE CONSTRUCTS DATA PACKETS CONSISTING OF SYMBOL CHARACTER DATA, TRANSMITTER NUMBER, DATA PACKET GROUP NUMBER, CHECK CHARACTER AND FRAMING CHARACTERS
X
IS IN-RF RANGE CONFIRMATION Signal A_5=1 ?
NO
YES
Y
ARE DATA PACKET Group(s) STORED IN DATA PACKET GROUP BUFFER ?
NO
YES
Z
C_3 Control Module Generates Enable Signal E_{11}=1 ReLoading Buffered Data Packet Group(s) into Data Packet Transmission Circuit
AA
Control Module C_3 Generates Enable Signal E_{10}=1 loading currently Synthesized Data Packet Group into Data Packet Transmission Circuit
BB
11

FIG. 46C2

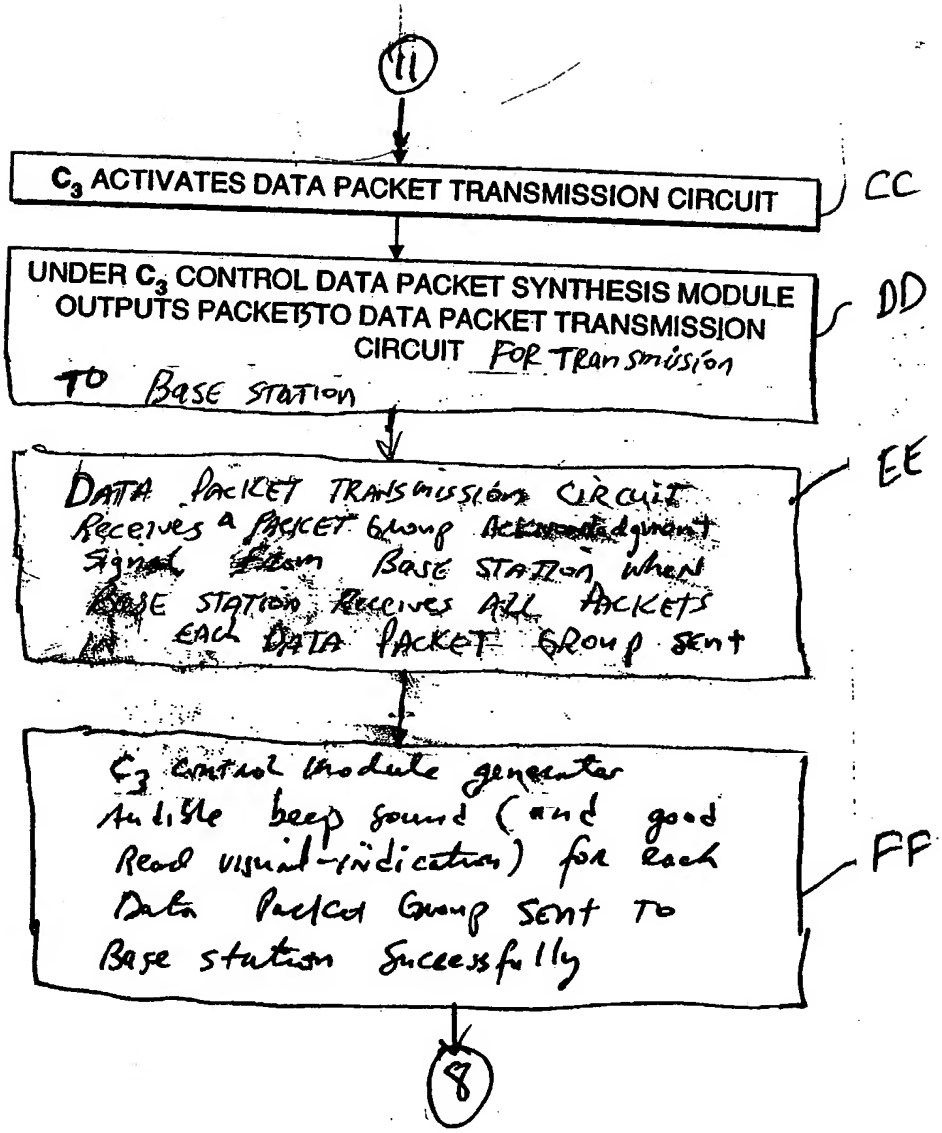

11
C_3 ACTIVATES DATA PACKET TRANSMISSION CIRCUIT
CC
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE OUTPUTS PACKETS TO DATA PACKET TRANSMISSION CIRCUIT FOR TRANSMISSION TO BASE STATION
DD
DATA PACKET TRANSMISSION CIRCUIT RECEIVES A PACKET GROUP ACKNOWLEDGMENT SIGNAL FROM BASE STATION WHEN BASE STATION RECEIVES ALL PACKETS IN EACH DATA PACKET GROUP SENT
EE
C_3 control module generates audible beep sound (and good read visual-indication) for each Data Packet Group sent to Base station successfully
FF
8

FIG. 46C3

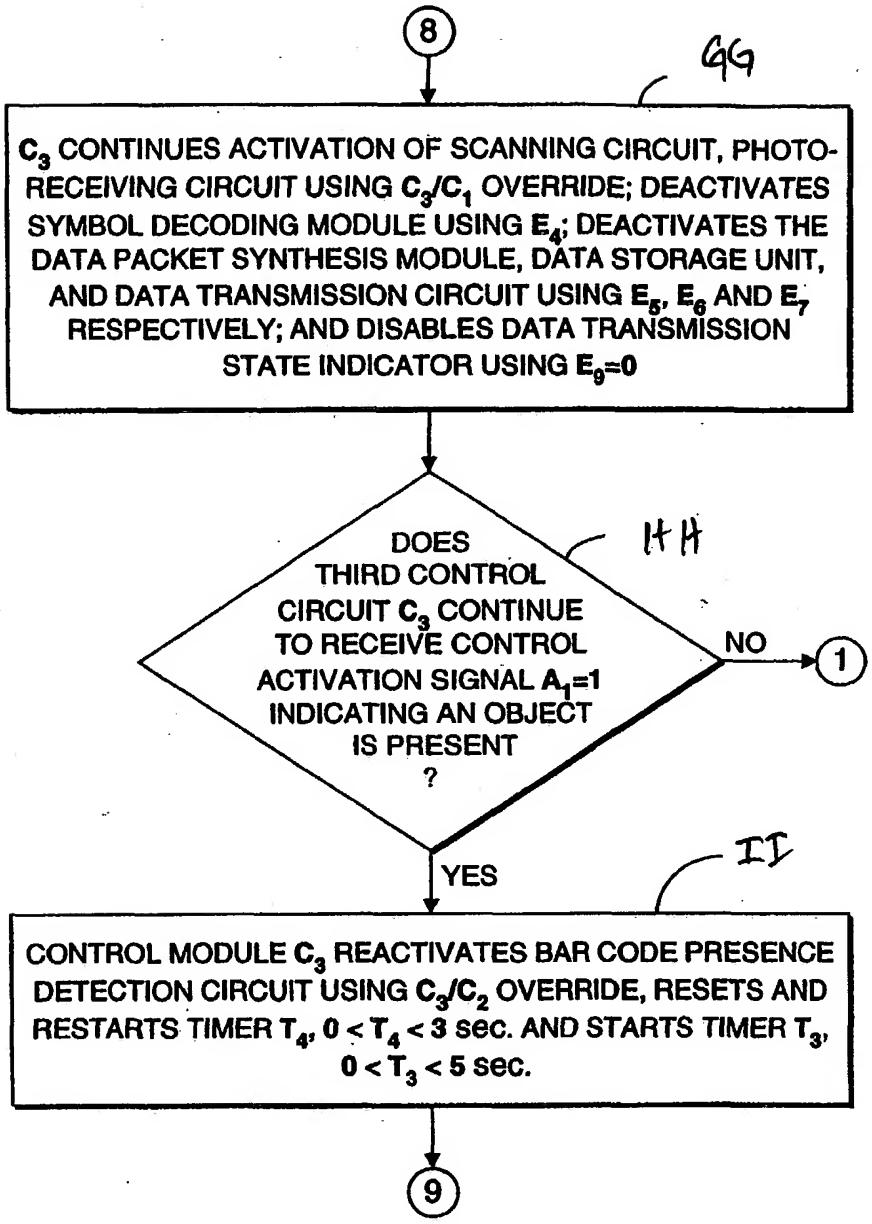

8
GG
C_3 CONTINUES ACTIVATION OF SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT USING C_3/C_1 OVERRIDE; DEACTIVATES SYMBOL DECODING MODULE USING E_4; DEACTIVATES THE DATA PACKET SYNTHESIS MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT USING E_5, E_6 AND E_7 RESPECTIVELY; AND DISABLES DATA TRANSMISSION STATE INDICATOR USING E_9=0
HH
DOES THIRD CONTROL CIRCUIT C_3 CONTINUE TO RECEIVE CONTROL ACTIVATION SIGNAL A_1=1 INDICATING AN OBJECT IS PRESENT ?
NO
1
YES
II
CONTROL MODULE C_3 REACTIVATES BAR CODE PRESENCE DETECTION CIRCUIT USING C_3/C_2 OVERRIDE, RESETS AND RESTARTS TIMER T_4, $0 < T_4 < 3$ sec. AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
9

FIG 46C4

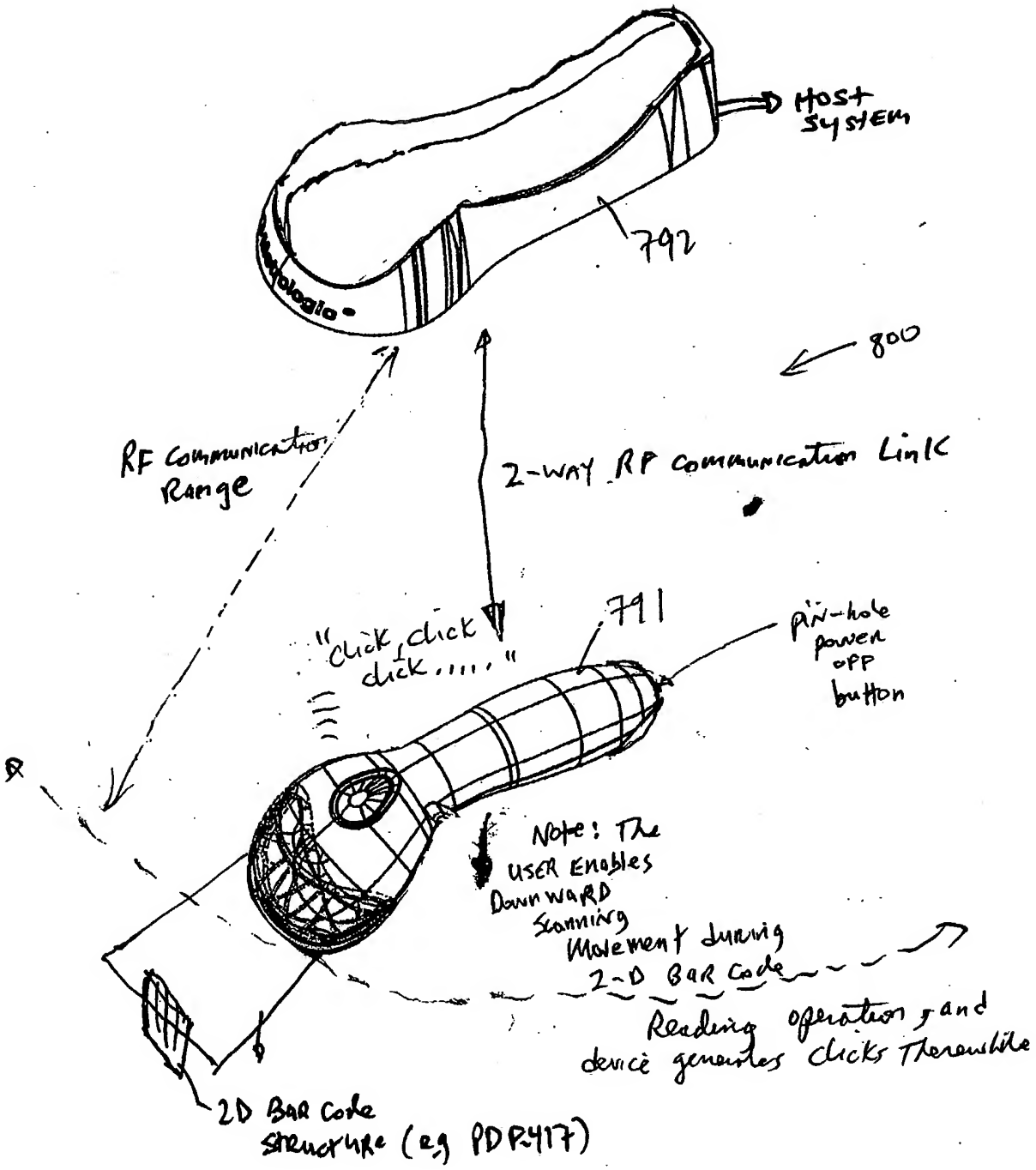

HOST SYSTEM
792
800
RF COMMUNICATION RANGE
2-WAY RF COMMUNICATION LINK
"CLICK, CLICK CLICK....."
791
PIN-HOLE POWER OFF BUTTON
NOTE: THE USER ENABLES DOWNWARD SCANNING MOVEMENT DURING 2-D BAR CODE READING OPERATION, AND DEVICE GENERATES CLICKS THEREWHILE
2D BAR CODE STRUCTURE (E.G. PDF417)

FIG. 47

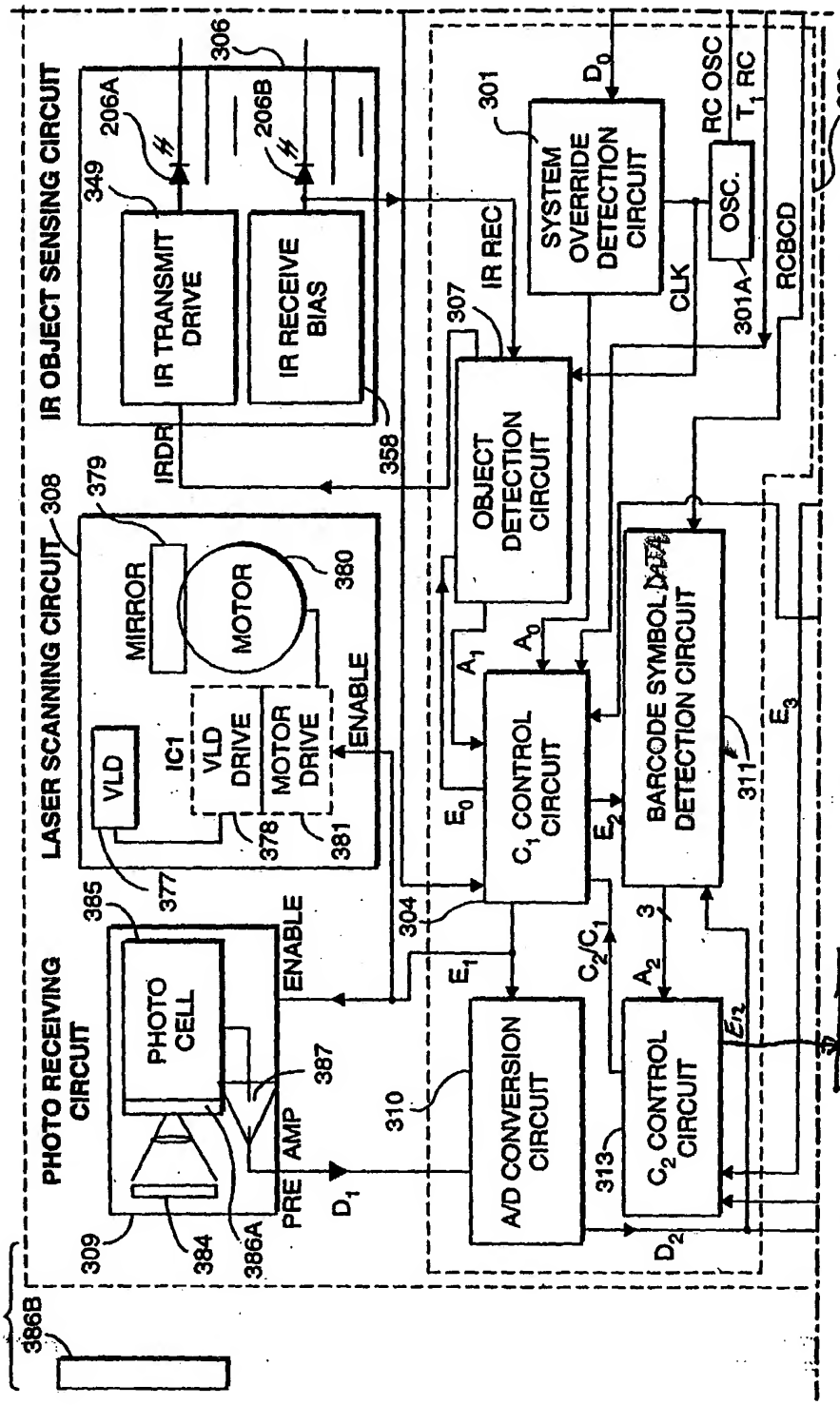


PHOTO RECEIVING CIRCUIT
LASER SCANNING CIRCUIT
IR OBJECT SENSING CIRCUIT
PHOTO CELL
PRE AMP
ENABLE
VLD
IC1
VLD DRIVE
MOTOR DRIVE
ENABLE
MIRROR
MOTOR
IR TRANSMIT DRIVE
IR RECEIVE BIAS
IRDR
IR REC
OBJECT DETECTION CIRCUIT
SYSTEM OVERRIDE DETECTION CIRCUIT
OSC.
RC OSC
T_1 RC
RCBCD
CLK
C_1 CONTROL CIRCUIT
BARCODE SYMBOL DETECTION CIRCUIT
A/D CONVERSION CIRCUIT
C_2 CONTROL CIRCUIT
C_2/C_1
D_0
D_1
D_2
E_0
E_1
E_2
E_3
A_0
A_1
A_2
309
310
311
313
333
377
378
379
380
381
384
385
386A
386B
387
301
301A
304
306
307
308
349
358
206A
206B
3
800
806
(piezo-electric transducer)

FIG. 47A1

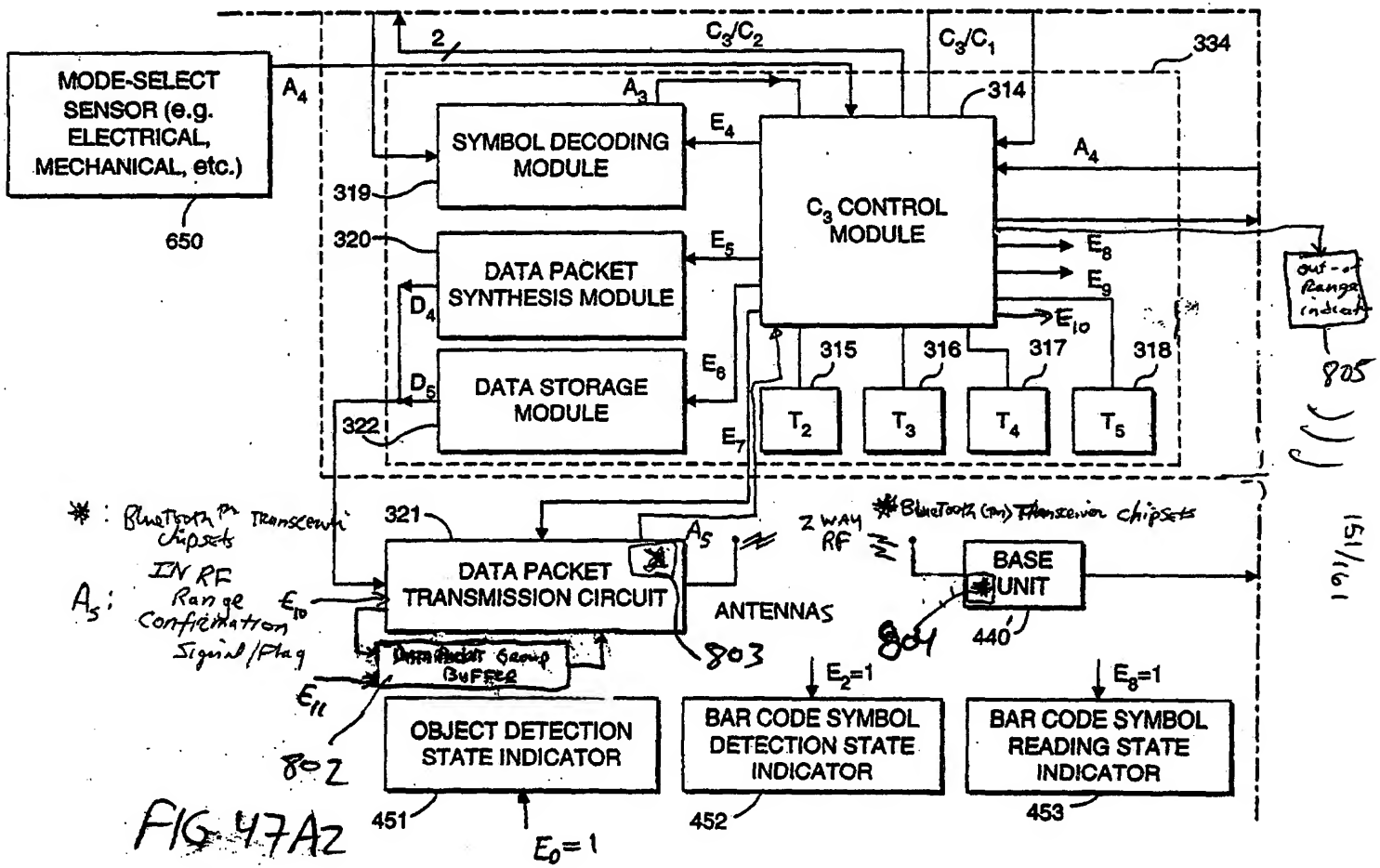

MODE-SELECT SENSOR (e.g. ELECTRICAL, MECHANICAL, etc.)
650
A4
2
C3/C2
C3/C1
334
314
A3
SYMBOL DECODING MODULE
319
E4
C3 CONTROL MODULE
A4
320
DATA PACKET SYNTHESIS MODULE
E5
D4
E8
E9
E10
out-of Range indicat
805
315
316
317
318
DATA STORAGE MODULE
E6
D5
322
E7
T2
T3
T4
T5
321
A5
2 WAY RF
BASE UNIT
440
804
DATA PACKET TRANSMISSION CIRCUIT
ANTENNAS
803
E10
E11
802
E2=1
E8=1
OBJECT DETECTION STATE INDICATOR
BAR CODE SYMBOL DETECTION STATE INDICATOR
BAR CODE SYMBOL READING STATE INDICATOR
451
452
453
E0=1
151/161

FIG 47A2

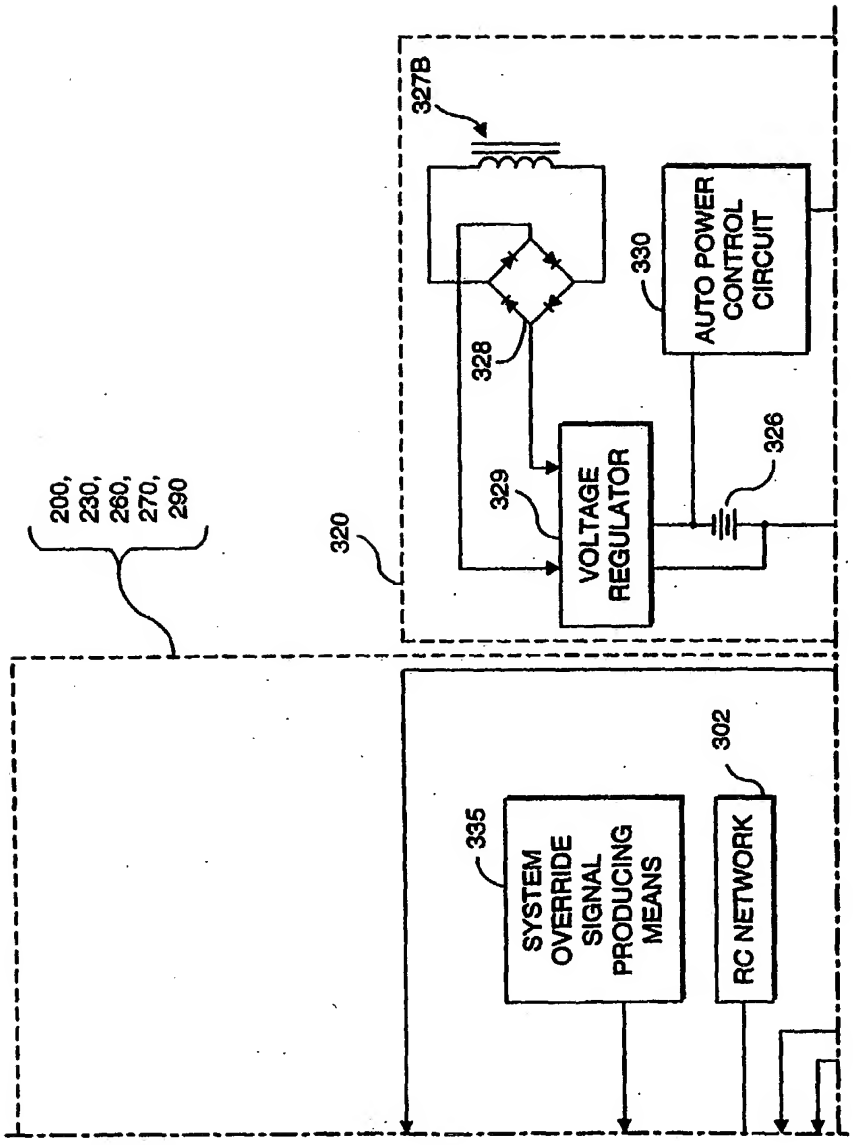

200, 230, 260, 270, 290
320
327B
328
329
326
330
AUTO POWER CONTROL CIRCUIT
VOLTAGE REGULATOR
335
SYSTEM OVERRIDE SIGNAL PRODUCING MEANS
302
RC NETWORK

FIG 47A3

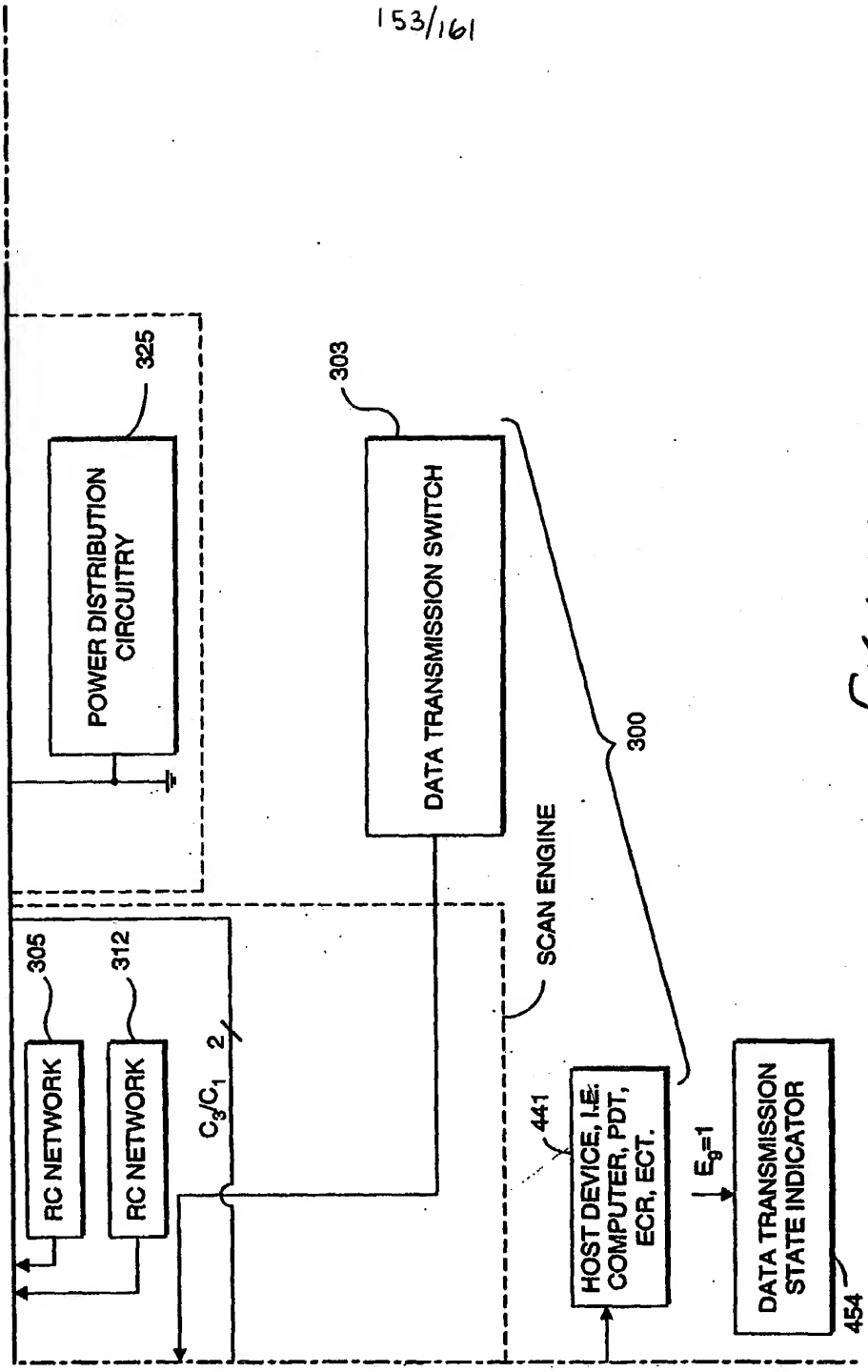

POWER DISTRIBUTION CIRCUITRY
325
303
DATA TRANSMISSION SWITCH
300
SCAN ENGINE
305
RC NETWORK
312
RC NETWORK
C_2/C_1 2
441
HOST DEVICE, I.E. COMPUTER, PDT, ECR, ECT.
E_g=1
DATA TRANSMISSION STATE INDICATOR
454

FIG. 47A4

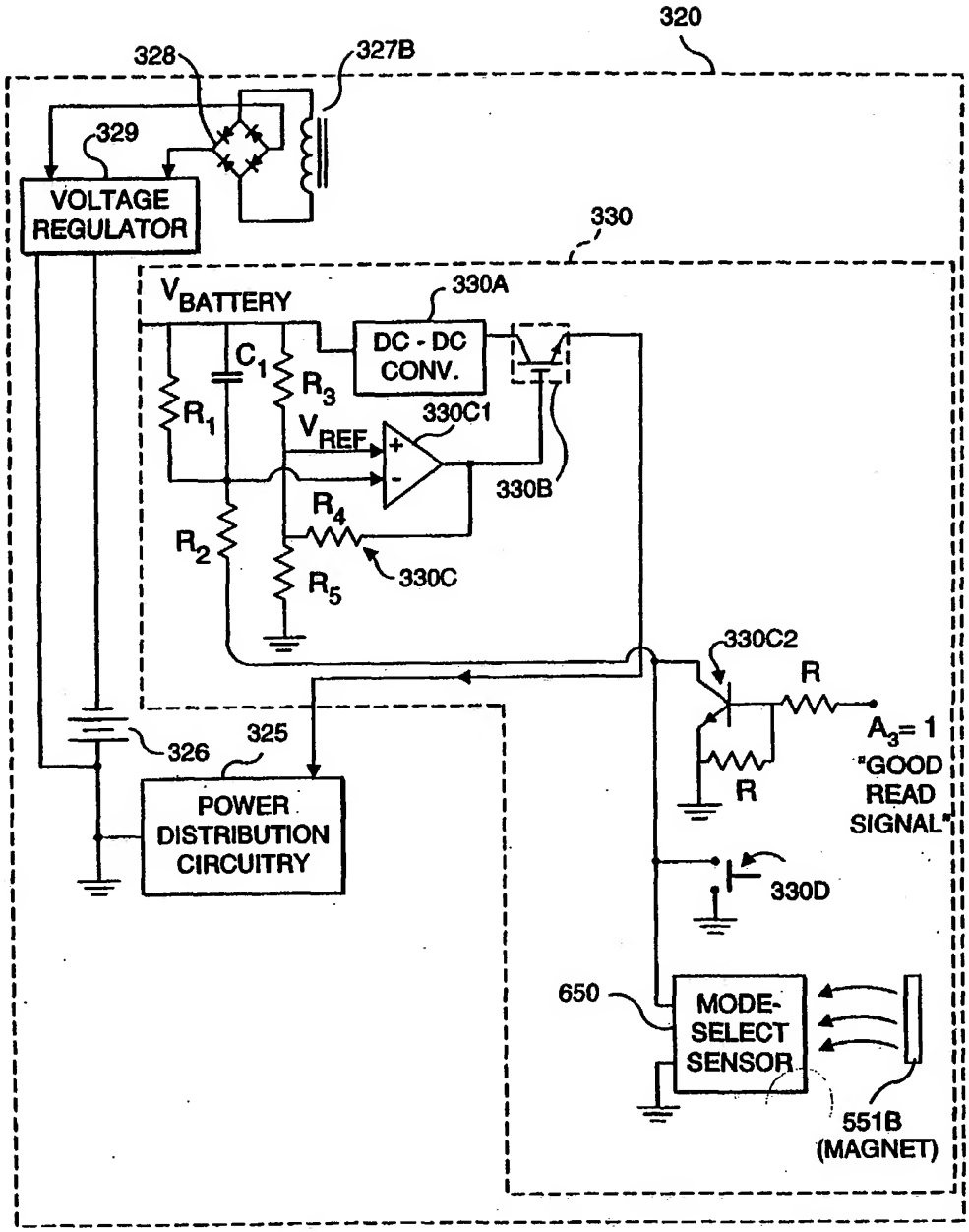

320
328
327B
329
VOLTAGE REGULATOR
330
$V_{BATTERY}$
330A
DC - DC CONV.
C_1
R_3
R_1
V_{REF}
330C1
330B
R_4
R_2
R_5
330C
330C2
R
A_3= 1 "GOOD READ SIGNAL"
R
326
325
POWER DISTRIBUTION CIRCUITRY
330D
650
MODE-SELECT SENSOR
551B (MAGNET)

FIG. 47B

PDF DATA Packet Transmission VIA 2-WAY RF WITH Automatic RP-Range Dependent Control

(2-D Reading Mode)

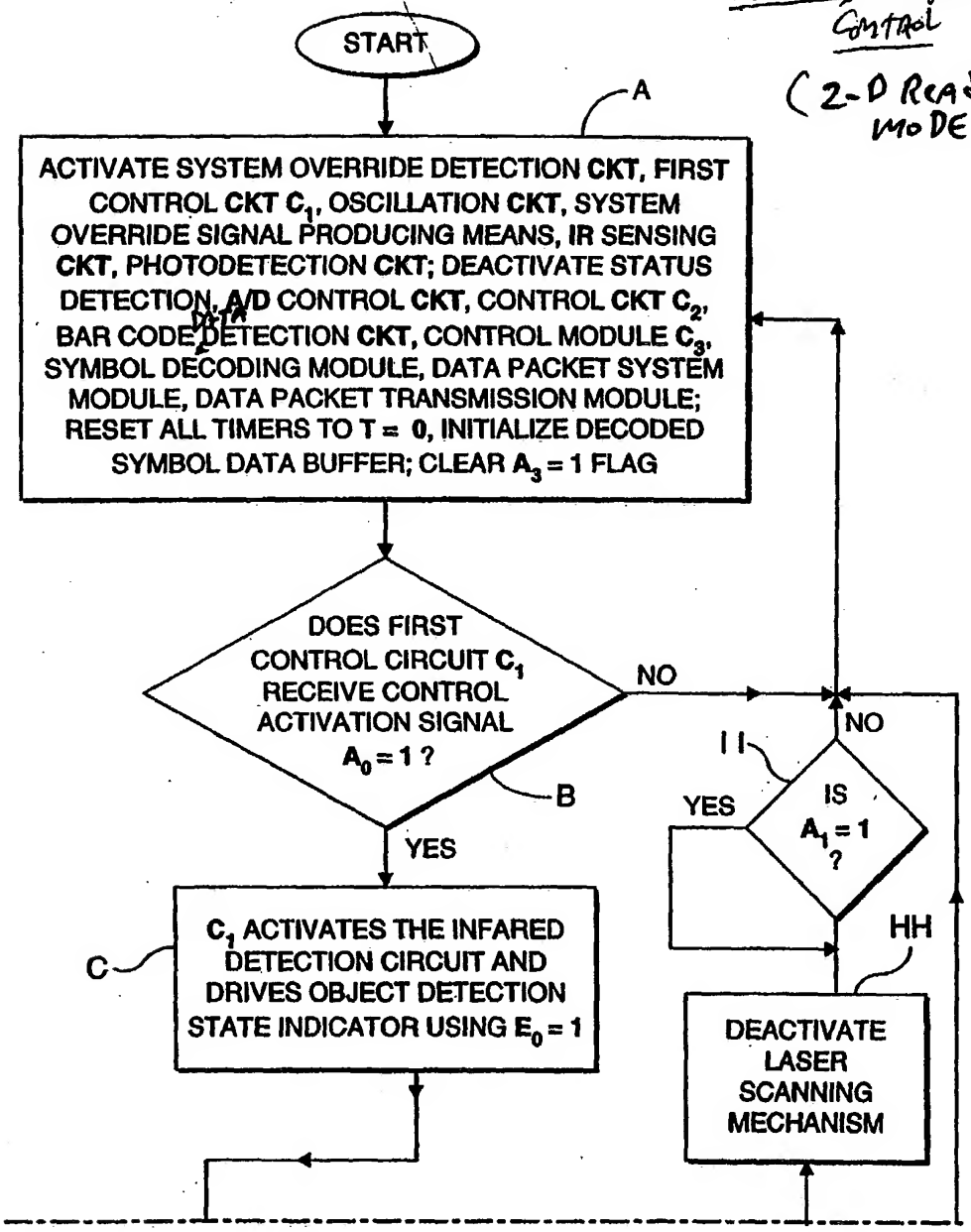


FIG. 48A1

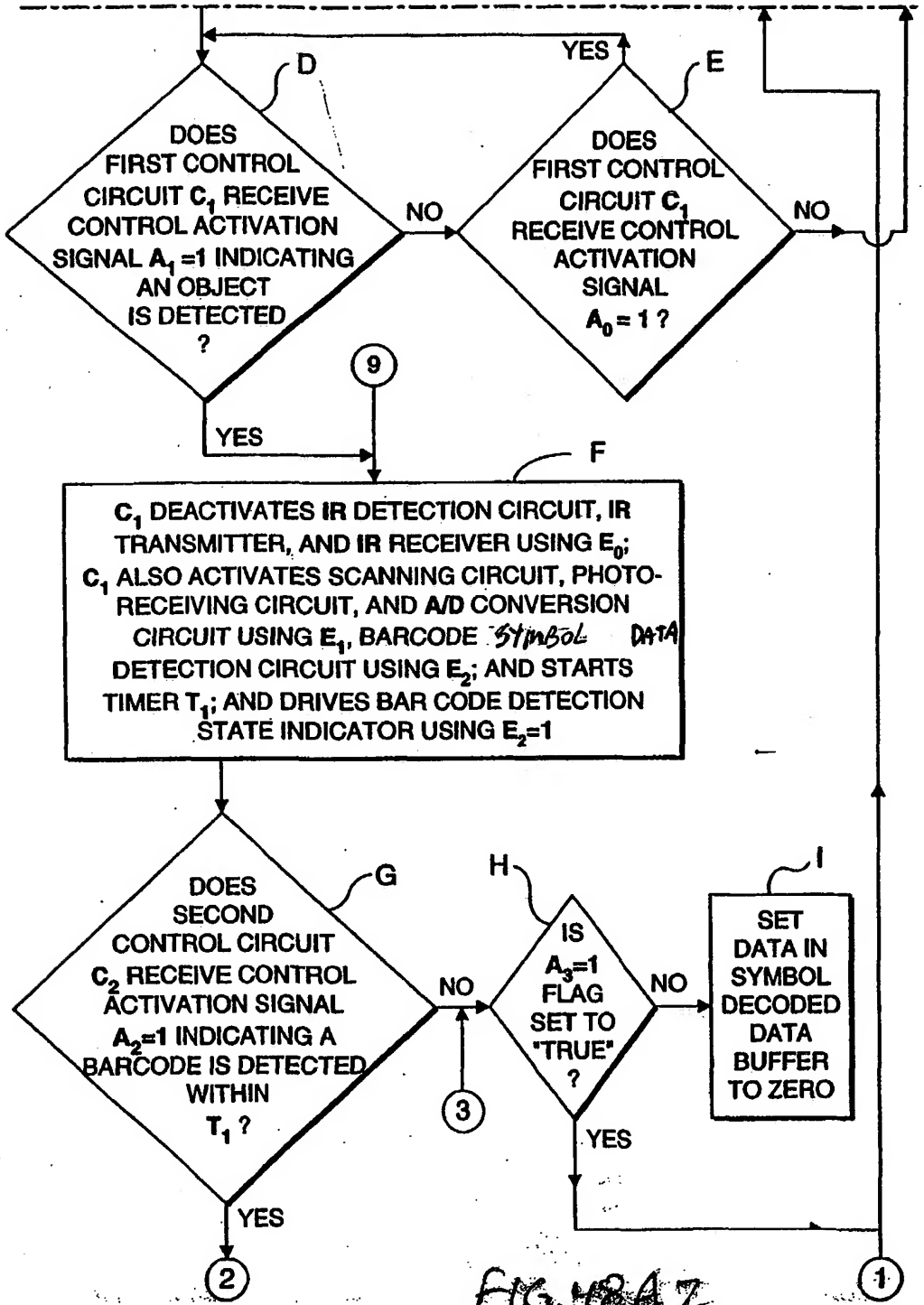

D
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_1 =1 INDICATING AN OBJECT IS DETECTED ?
NO
E
DOES FIRST CONTROL CIRCUIT C_1 RECEIVE CONTROL ACTIVATION SIGNAL A_0 = 1 ?
YES
NO
9
YES
F
C_1 DEACTIVATES IR DETECTION CIRCUIT, IR TRANSMITTER, AND IR RECEIVER USING E_0; C_1 ALSO ACTIVATES SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT, AND A/D CONVERSION CIRCUIT USING E_1, BARCODE SYMBOL DATA DETECTION CIRCUIT USING E_2; AND STARTS TIMER T_1; AND DRIVES BAR CODE DETECTION STATE INDICATOR USING E_2=1
G
DOES SECOND CONTROL CIRCUIT C_2 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 INDICATING A BARCODE IS DETECTED WITHIN T_1 ?
NO
H
IS A_3=1 FLAG SET TO "TRUE" ?
NO
I
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
YES
3
YES
2
1

FIG. 18A2

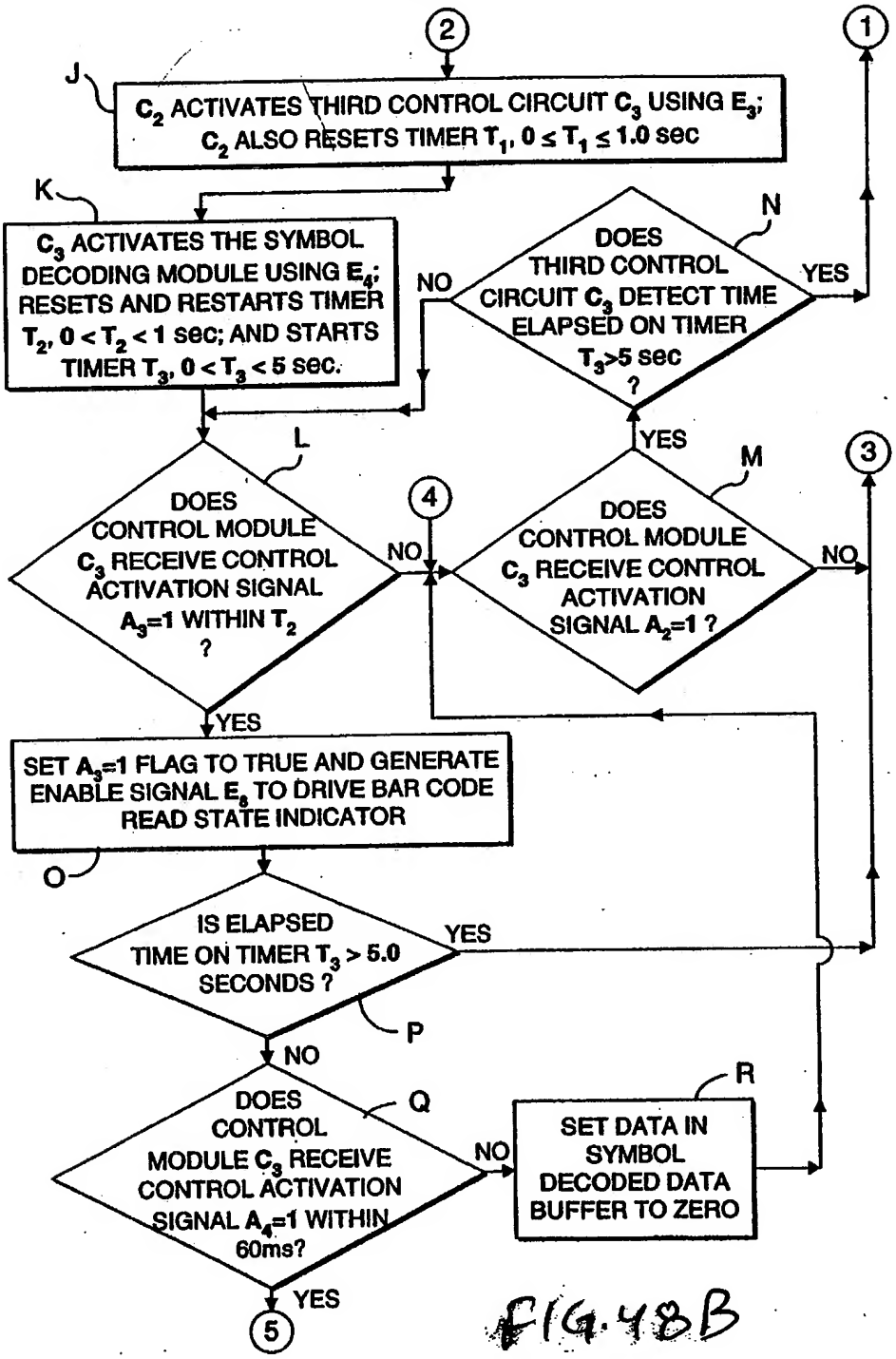

2
1
J
C_2 ACTIVATES THIRD CONTROL CIRCUIT C_3 USING E_3; C_2 ALSO RESETS TIMER T_1, $0 \leq T_1 \leq 1.0$ sec
K
C_3 ACTIVATES THE SYMBOL DECODING MODULE USING E_4; RESETS AND RESTARTS TIMER T_2, $0 < T_2 < 1$ sec; AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
N
DOES THIRD CONTROL CIRCUIT C_3 DETECT TIME ELAPSED ON TIMER T_3>5 sec ?
NO
YES
YES
L
M
3
4
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_3=1 WITHIN T_2 ?
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_2=1 ?
NO
YES
SET A_3=1 FLAG TO TRUE AND GENERATE ENABLE SIGNAL E_5 TO DRIVE BAR CODE READ STATE INDICATOR
O
IS ELAPSED TIME ON TIMER T_3 > 5.0 SECONDS ?
YES
P
NO
DOES CONTROL MODULE C_3 RECEIVE CONTROL ACTIVATION SIGNAL A_4=1 WITHIN 60ms?
Q
NO
R
SET DATA IN SYMBOL DECODED DATA BUFFER TO ZERO
YES
5

FIG. 48B

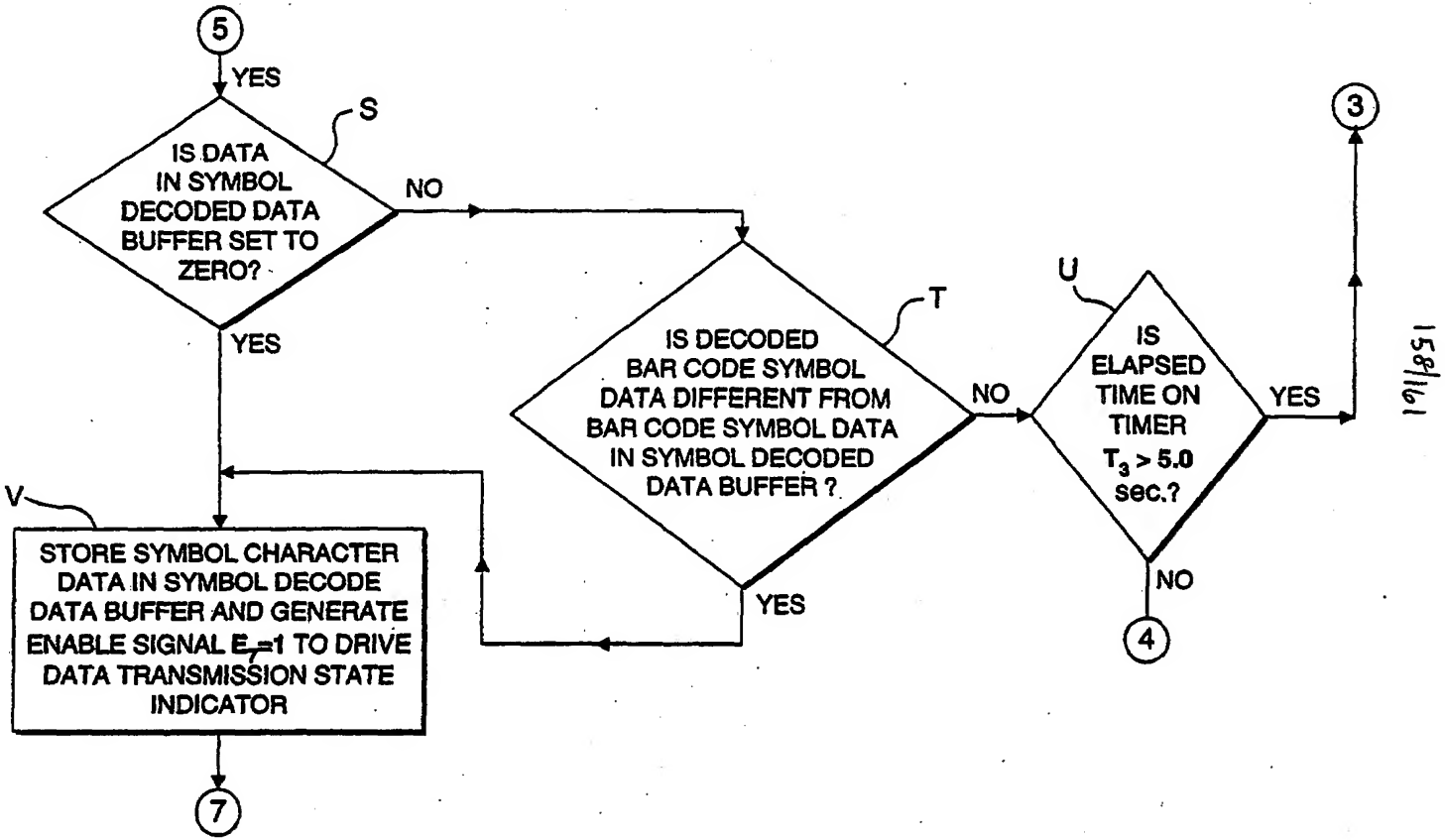

5
YES
S
IS DATA IN SYMBOL DECODED DATA BUFFER SET TO ZERO?
NO
YES
T
IS DECODED BAR CODE SYMBOL DATA DIFFERENT FROM BAR CODE SYMBOL DATA IN SYMBOL DECODED DATA BUFFER ?
NO
U
IS ELAPSED TIME ON TIMER $T_3 > 5.0$ sec.?
YES
3
NO
4
YES
V
STORE SYMBOL CHARACTER DATA IN SYMBOL DECODE DATA BUFFER AND GENERATE ENABLE SIGNAL E_7=1 TO DRIVE DATA TRANSMISSION STATE INDICATOR
7
158/161

FIG. 48C1

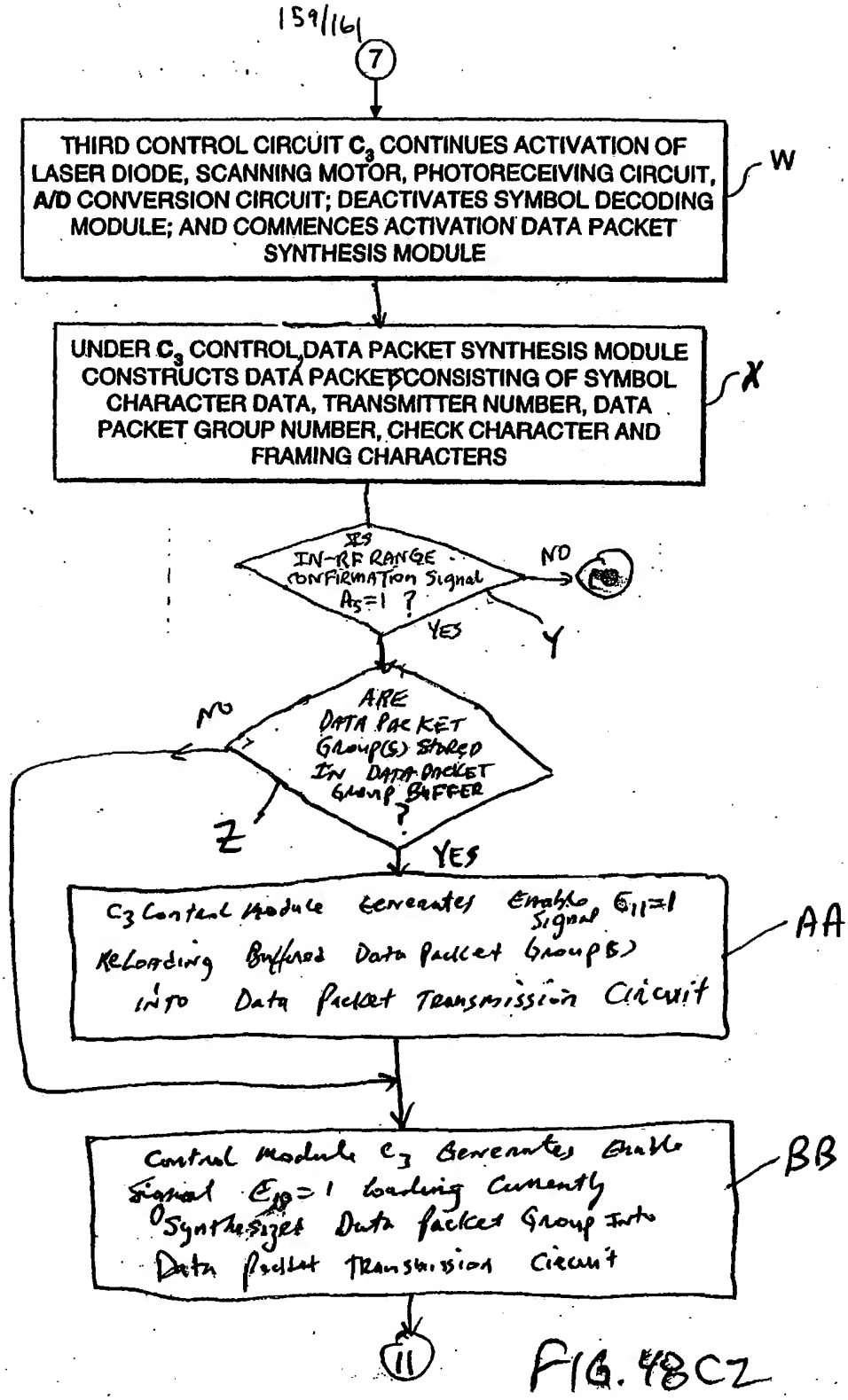

7
THIRD CONTROL CIRCUIT C_3 CONTINUES ACTIVATION OF LASER DIODE, SCANNING MOTOR, PHOTORECEIVING CIRCUIT, A/D CONVERSION CIRCUIT; DEACTIVATES SYMBOL DECODING MODULE; AND COMMENCES ACTIVATION DATA PACKET SYNTHESIS MODULE
W
UNDER C_3 CONTROL, DATA PACKET SYNTHESIS MODULE CONSTRUCTS DATA PACKETS CONSISTING OF SYMBOL CHARACTER DATA, TRANSMITTER NUMBER, DATA PACKET GROUP NUMBER, CHECK CHARACTER AND FRAMING CHARACTERS
X
IS IN-RF RANGE CONFIRMATION Signal A_5=1 ?
NO
YES
Y
ARE DATA PACKET GROUP(S) STORED IN DATA PACKET GROUP BUFFER ?
NO
Z
YES
C_3 Control Module Generates Enable Signal E_{11}=1 Reloading Buffered Data Packet Group(s) into Data Packet Transmission Circuit
AA
Control Module C_3 Generates Enable Signal E_{10}=1 loading Currently Synthesized Data Packet Group into Data Packet Transmission Circuit
BB
11

FIG. 48C2

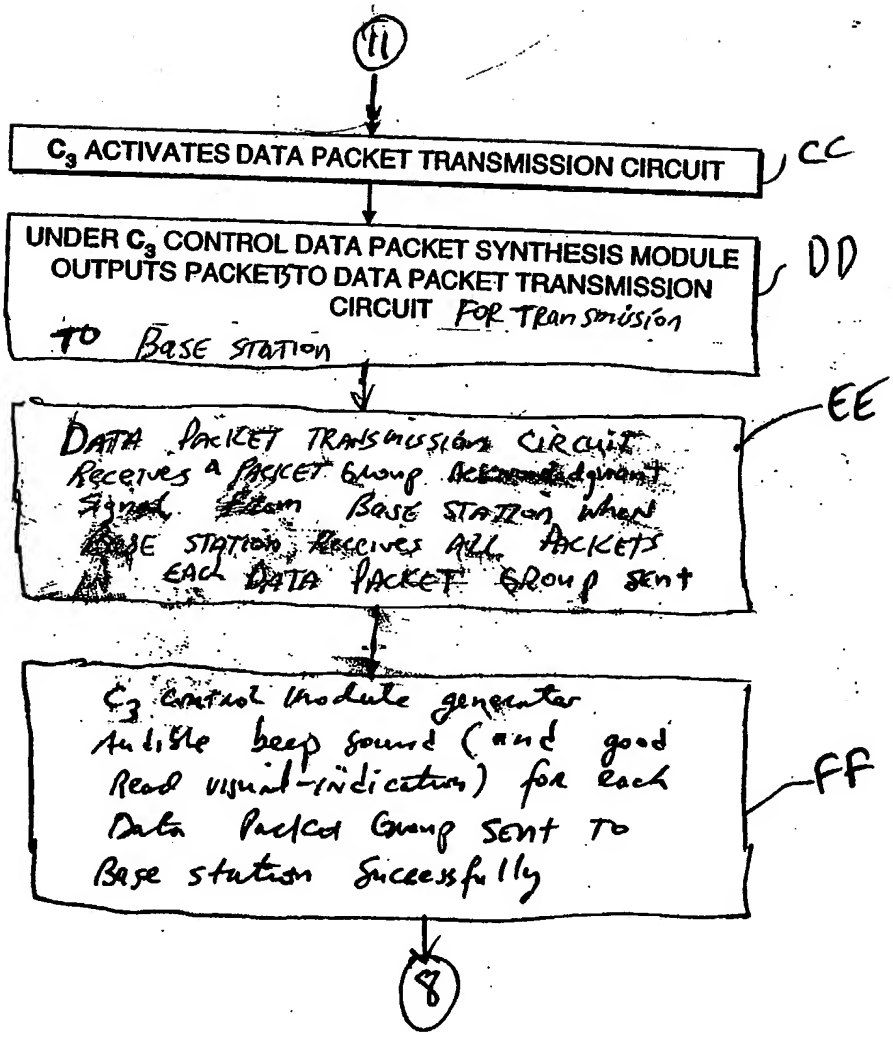

11
C_3 ACTIVATES DATA PACKET TRANSMISSION CIRCUIT
CC
UNDER C_3 CONTROL DATA PACKET SYNTHESIS MODULE OUTPUTS PACKETS TO DATA PACKET TRANSMISSION CIRCUIT FOR TRANSMISSION TO BASE STATION
DD
DATA PACKET TRANSMISSION CIRCUIT RECEIVES A PACKET GROUP ACKNOWLEDGMENT SIGNAL FROM BASE STATION WHEN BASE STATION RECEIVES ALL PACKETS EACH DATA PACKET GROUP SENT
EE
C_3 control module generates audible beep sound (and good read visual-indication) for each Data Packet Group sent to Base station successfully
FF
8

FIG. 48C3

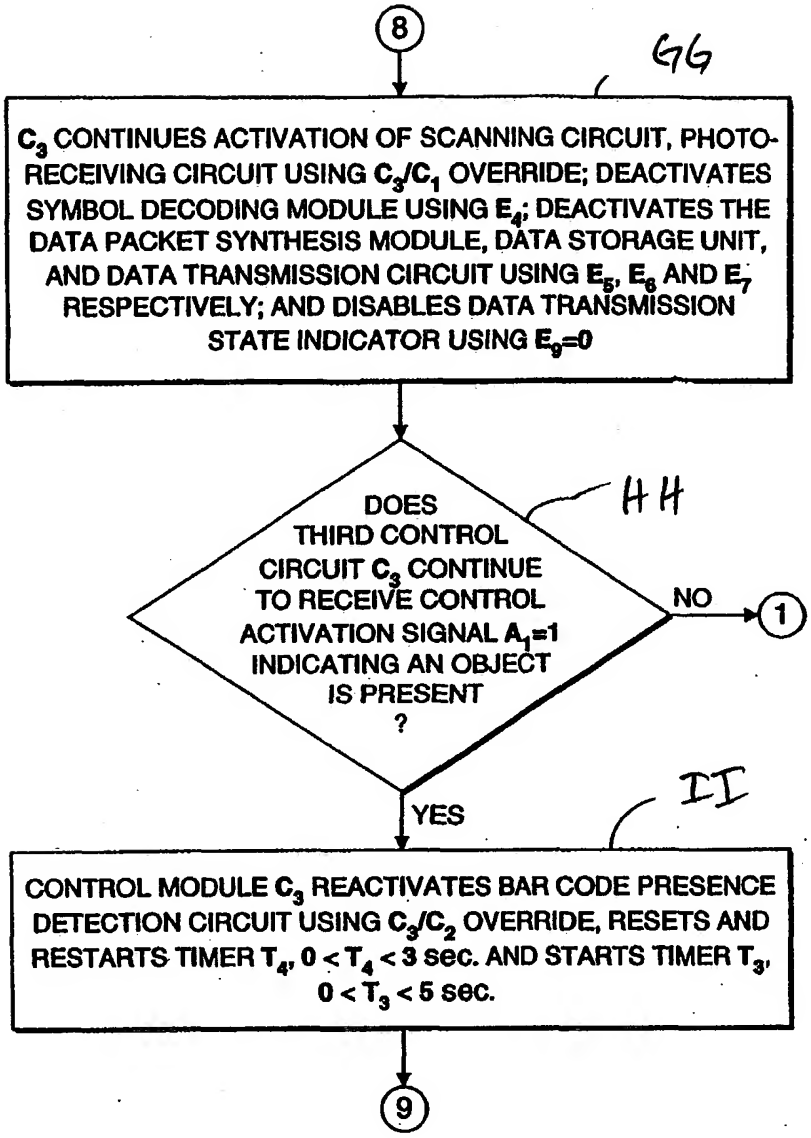

8
GG
C_3 CONTINUES ACTIVATION OF SCANNING CIRCUIT, PHOTO-RECEIVING CIRCUIT USING C_3/C_1 OVERRIDE; DEACTIVATES SYMBOL DECODING MODULE USING E_4; DEACTIVATES THE DATA PACKET SYNTHESIS MODULE, DATA STORAGE UNIT, AND DATA TRANSMISSION CIRCUIT USING E_5, E_6 AND E_7 RESPECTIVELY; AND DISABLES DATA TRANSMISSION STATE INDICATOR USING E_9=0
HH
DOES THIRD CONTROL CIRCUIT C_3 CONTINUE TO RECEIVE CONTROL ACTIVATION SIGNAL A_1=1 INDICATING AN OBJECT IS PRESENT ?
NO
1
YES
II
CONTROL MODULE C_3 REACTIVATES BAR CODE PRESENCE DETECTION CIRCUIT USING C_3/C_2 OVERRIDE, RESETS AND RESTARTS TIMER T_4, $0 < T_4 < 3$ sec. AND STARTS TIMER T_3, $0 < T_3 < 5$ sec.
9

FIG. 48C4